OCT 28 1930

VETERINARY MEDICINE

November, 1930

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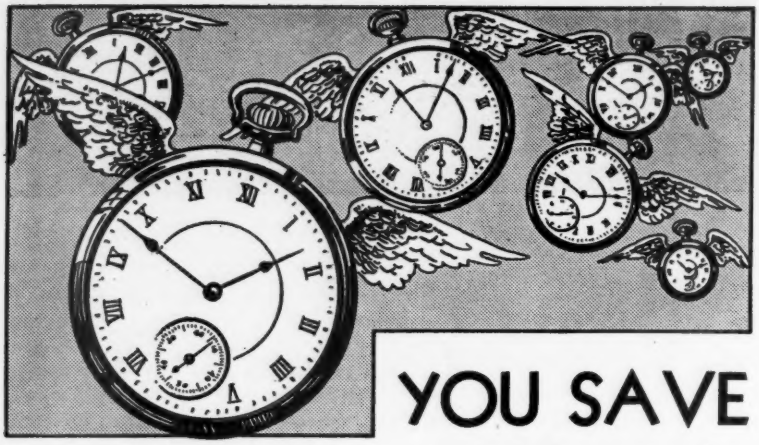
No. 11
VOL. XXV

75 E. Wacker Drive
Chicago, U. S. A.



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Veterinary Medicine

VOL. XXV NOVEMBER, 1930 No.'11

Published Monthly by the Veterinary Magazine Corporation
75 East Wacker Drive, Chicago, Ill., U. S. A.
$4.00 a Year

Entered as second-class matter Nov. 8, 1920, at the post office at Chicago, Ill., under the Act of Mar. 3, 1879.

Entered as second-class matter under the title of American Journal of Veterinary Medicine, July 19, 1910. at Chicago, Illinois, under Act of March 3, 1879.

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D. M. Campbell, Editor A. T. Kinsley, Associate Editor

The per capita consumption of ice cream in 1905 was 1.04 gallons. In 1928, it was 2.9 gallons, nearly three times as much.—*Hoard's Dairyman.*

There are 4,000 ice cream plants in the United States. In 1928 about 350 million gallons of ice cream was made in commercial plants. This required about six billion pounds of milk and into it went more than 208 million pounds of butter fat, and nearly 175 million pounds of milk solids other than butter fat. Three-fourths of the year's production of ice cream is made in the period of April to September inclusive, during and following the season when the production of milk is the heaviest, and helps to maintain the price paid the dairy farmer in the summer months.—*Hoard's Dairyman.*

Endocrine gland investigations have revealed many interesting and important facts. Recently Greuter of Switzerland reported experiments in which he demonstrated that by the injection of a hormone obtained from the anterior pituitary gland there was a marked increase in milk production. This hormone does not initiate milk production during the non-lactating period but increases it in animals that are lactating. This product will no doubt be of interest to dairymen. However, it will be necessary to provide a proper ration and the hormone being only an adjunct.—*Science* Vol. 72, No. 1862.

The amount of dairy products used in the manufacture of ice cream in the United States, calculated in terms of whole milk, is almost equal to the amount used in the manufacture of cheese, and is greater than the amount used in the manufacture of condensed and evaporated milk.—*Hoard's Dairyman.*

The small dairy that produces and delivers whole raw milk direct to the consumer is rapidly passing and in its place has come cooperative marketing of milk. Almost one-half of the fluid milk in the United States is now marketed by cooperatives. This form of marketing of milk will no doubt ultimately result in universal pasteurization and will thus eliminate the small, raw milk dairyman.

The first newspaper advertisement of ice cream seems to have been one which appeared in *The New York Gazette* of May 19, 1777. One story says that Dolly Madison; the popular wife of President James Madison, was the first to introduce ice cream into the social affairs of the White House. Another gives to Mrs. Alexander Hamilton, wife of the financial genius, who greatly aided George Washington in firmly establishing the Republic, the credit for having first served ice cream at social functions in the National Capital. Whoever it was who introduced ice cream into America, he started a great industry which is very important to all our people, including, of course, our dairy farmers.—*Hoard's Dairyman.*

Irradiated yeast, according to reports of the experiments of Steenbock and associates, when fed in proper quantity to milk cows, overcomes the vitamin D deficiency and thus prevents the development of rickets that is so common in children fed on cow's milk. The cost of irradiated yeast amounts to only a fraction of a cent per quart of milk produced.—*Science 72*, No. 1863.

It would be interesting to know whether live stock that are fed on molasses or other feed having a relatively high sugar content evidence decay or caries of the teeth, because it has been found by Bunting and his associates that dental caries was of rare occurrence in children that were provided a diet for a nine-month period containing only sufficient sugar to make the food palatable, where as this condition was relatively prevalent in another group of children that were given sweets, candy, etc., in abundance. —*Science 72*, No. 1863.

According to Shiga the occurrence of leprosy is dependent upon a special susceptibility probably the result of vitamin deficiency. If this suggestion is correct, leprosy, the dreaded scourge of mankind, can be eradicated in one generation by providing a proper diet. It is interesting to speculate on the possible relation of a deficient diet on the apparent increase of infective diseases, for it is certain that by persistent cropping essential constituents are diminished in soils and consequently in grains and other products of the soil. —*Science*, Vol. 72, No. 1861.

Anemia in suckling pigs due to a deficiency in hemoglobin is quite prevalent in spring-farrowed pigs. Many cases of this condition were reported by veterinarians in 1930. Anemia, or nutritional anemia, usually occurs in pigs that are housed continuously for 10 days to two weeks after farrowing. The affected pigs are unthrifty (?) and a large percentage of those affected die within a few days. It can be successfully controlled and treated by the administration of 25 miligrams of citrate of iron daily.—*Jour. Agr. Research* 40-10.

Many bucks of the dairy breeds of goats, for some unexplained reason, are infertile. Does usually evidence estrum every three weeks until bred. It is claimed that milk acquires a "goaty" flavor when the buck is permitted to run with a herd of goats in milk.—Calif. Cir. No. 6.

An anemia occurs in dogs that are fed daily 15 grams or more of onions, either cooked or raw, per kilo of body weight. This effect of onions was discovered accidentally by Sebrell in experimental work on the relation of diet to blacktongue in dogs. Although we do not believe that dogs normally eat onions either cooked or raw, this finding of Sebrell's is interesting. —*Public Health Report*, Vol. 45, No. 21.

Trinchera has stated that the transmission of the infection of abortion disease is not of rare occurrence with bulls, and Reindell and Sand have formed the same opinion, whilst Bang assumes that copulation plays an extremely important part in the transmission of the disease. In recent years, however, less stress has been put upon the importance of bulls in this respect, since such experimental transference has given negative results (Schroeder, Thomsen and others). I consider, however, that the numerous observations made in practice, which clearly show that bulls can transmit the disease, cannot be explained away, and we should therefore still attach some importance to them as sources of infection."—Holth, Oslo, Inter. Vet. Cong.

One peculiarity of abortion infection in swine is that it appears to depend upon bacilli of considerably greater virulence than those which are generally found in cattle, and also that they relatively often appear to be transferred to human beings. There can be no doubt that human beings are not rarely infected with abortion bacilli, and it would seem that veterinary surgeons and other persons who constantly come in contact with infected animals are very much exposed to infection whilst milk much less frequently appears to cause such infection.—Holth, Oslo, Inter. Vet. Cong.

There has been some confusion on the part of the consumer relative to what he obtains when he purchases veal. Some retail butchers class all young beef as veal. The proper classification according to Davis, marketing specialist, is as follows: Veal is the flesh of bovines that are not over 12 or 14 weeks of age; calf meat is from bovines over 12 or 14 weeks of age, but yet have not taken on all the beef characteristics.—U. S. Dept. of Agric. Cir. 103.

Poultry investigators have apparently agreed to designate the malady produced by the *B. pullorum* as "Pullorum Disease," thus discarding the term "Bacillary White Diarrhea." Apparently some progress is being made in the control of this malady by repeated agglutination tests of flocks and the removal of reactors. From reports it is evident that the rapid agglutination test and the intradermal test are not as reliable as the slow, tube, agglutination test.—Calif. Bul. No. 486.

Very reliable methods of immunizing animals against blackleg are now available. The value of aggressin is generally recognized and this product has been used on a very large scale with most satisfactory results. It has proved itself superior to the vaccines previously employed on account of its absolute safety and high immunizing value. Artificial aggressin (filtrate) is to be preferred to the natural product as it is at least as potent and is much less troublesome and costly to prepare. The introduction of formolised vaccine by Leclainche and Vallée constitutes a further important advance in blackleg immunization. This vaccine has been used for the protection of animals in affected districts and has been found to be both safe and efficient. Its immunizing value, as has been demonstrated, experimentally by several independent investigators, would appear to be higher on the average than that of aggressin. The antigenic properties of this vaccine are derived partly from the dead organisms which it contains and partly from the presence of aggressin.—Bosworth, England, Inter. Vet. Cong.

The knowledge a physician or surgeon brings to the bedside has, in its essense, been acquired and tested on animals. To be consistent, your antivivisectionist should never seek medical or surgical aid, but should consult the quack doctor who ignores medical science.—Sir Edward Sharpey-Schaefer, in *The Veterinary Record.*

The whole science of medicine, the operations of surgery, the action of drugs, the application of preventive and sanitary measures to the health of the community, are all bound up with animal experimentation.—Sir Edward Sharpey-Schaefer, in *The Veterinary Record.*

It is generally conceded that milk fever is associated with a hypocalcemia and probably also a hypophosphatemia. The cause of these deficiencies has not been definitely determined. Treatment should be such that the aforementioned deficiencies are overcome. Fish suggests the use of a 3% solution of calcium glycerophosphate in a 3% solution of glucose. The dosage being one liter injected intravenously. The glucose facilitates the solubility of the calcium glycerophosphate and tends to prevent scherosis of the vein. Greig, the discoverer of the cause of milk fever, recommends the subcutaneous injection of calcium gluconate.

The horse population on Michigan farms has steadily declined for a long period of years through the increased use of tractors as motive power. There are now 35% fewer horses than 10 years ago, of which a decrease of 3% or 12,000 head occurred during the year 1929. While there are indications of a slight increase during the last two years in the production of colts, the number annually raised in the state is inadequate to replace work horses that have died or been killed because of old age. This shortage is general over the country and, as has been predicted, for several years, has caused prices to advance. However, the gain in average value during the past year amounted to only one dollar per head.—Michigan Crop Report.

LUBRICATING OIL AS A LAXATIVE

I was recently called to see a large Holstein cow that had been given as a laxative a quart of heavy lubricating oil, the kind used in motors. This cow they said usually went off feed after calving, but they had successfully used the oil before with her as well as many other cows. She presented the following symptoms: Temperature 106 deg. F., high, hard pulse, fast breathing with intense pain, frequent urination, loose, bloody feces and no appetite. She died the third day after receiving the oil.

Did this oil have anything to do with her illness and if so how have they been getting by with it heretofore? Would thank you for a little light on this kind of a bovine laxative.—H. B. F., Ind.

Reply: As to the question as to whether the lubricating oil had anything to do with the death of this cow; no one can say positively without doing one of two things. (1) Have that lot of oil analyzed. (2) Take a few cows or young stock and drench them with the same oil.

I went through an experience of this sort some 10 or 12 years ago, where a pipe line went through a farmer's land. This pipe was fenced off from the pasture but, of course, in due time the fence got in bad shape and the cattle went in there. The pipes had been leaking some and there was considerable oil around the pools and particularly in a spring that was nearby. Several of the cows died and the farmer threatened suit for his loss.

The lawyers wanted to settle this out of court, if possible, and asked me to come to the office and talk the whole thing over. I explained to them that so far as I knew there was no literature on the subject of crude oil poisoning in cattle. At least, I could not find any. I further stated that, since these cattle had been well until they went into that enclosure and that as several of them had sickened and died afterward, it was evident that something in there had to do with their death. I advised the farmer to be fair and ask only what was just for his cattle, and I also suggested to the company that they might better pay the farmer than to be paying lawyers and witnesses. I explained to them that if either party kept me standing around several days as a witness that my fee would more than pay for the dead animals.

My people settled, so it never came to trial, notwithstanding the company considered it a bad precedent to pay for animals where it had not been proved that the company was at fault.

Of course, this concerns crude oil and we know that cows have been given quarts of kerosene without any apparent injury from it.

To me it is a very difficult matter to get any line on different grades of oil that salesmen come in and talk about.

For instance, some ten years ago a Standard Oil salesman sold us a grade of oil that is styled White Rose Neutral and assured us, with all the confidence of a Solomon, that it was just the thing where an oil was indicated as a cathartic or intestinal lubricant. We took his word for it and, at different times, bought barrels and barrels of it and used it for several years with, so far as we know, no injurious effects.

In due time another representative of the Standard Oil Company came along and was startled to think we had ever used a drop of it for internal medication, explaining that it was nothing more than a light lubricant and that it was never intended for anything but external application or lubrication. So there you are.

Grade Hereford and quadruplet calves. Photographed by Dr. L. F. Nisby

What does a lubricating oil contain that a more refined oil does not contain?

Is it kerosene and crude oil, of course, well diluted?

If so, then I do not think it would be poisonous to cattle.

If it contains lead or similar injurious ingredients, then it certainly would be poisonous.—J. F. D.

DRY LOT FEEDING OF HOGS

Personal observation in the swine raising industry leads me to make the statement that the better hog raisers, in order to insure a healthy pig crop, will be feeding their hogs exclusively on cement or wood block floors in the next twenty years. I predict that this will be used in the summer as well as the winter, and here is the reason: Practically all farms are poluted with the round worm and many of them have every variety of the eggs of other worms tucked away in some secluded spot.

It certainly seems that the McLean system, while good, is not the ideal way. I have in mind a farm where this system was practiced. The pigs became wormy and it was necessary to give them the worm treatment, composed of oil of chenopodium, and castor oil, the ideal treatment for worm infestation in swine. In checking up on this herd, it was found that the farmer had been hauling his corn on a wagon through the old lot. It was also brought to his attention that the chickens and ducks carried the worm eggs over on their muddy feet and deposited them in the mud where the hogs could easily pick them up.

The McLean system, if it can be carried out, is good but there are so many slips that the farmer loses faith if it does not work out perfectly each time. Another farmer bought a round farrowing house and placed his sows there until the pigs were three weeks old. He then hauled them out to a perfectly clean clover field, thinking he was safe from worms. The writer vaccinated these hogs and in three weeks was called back. Worms were discovered and the pigs given the regular treatment. Worms 15 and 20 in a bunch were expelled from these hogs. Now they are putting on pounds rapidly.

In this case, the pigs picked up the egg from the sows in the round farrowing house. You can readily see that the sows should be wormed often. It seems to me that the worming of pigs is something that has been overlooked by the veterinarian and he has allowed the layman to take this phase of the business.

Just recently, in order to determine the best feeding standards for my clients, I installed a cement feeding floor where I can run all kinds of feeding experiments on hogs because I realize the more money my clients make the more money I make. This work also gives me an opportunity to learn more about the hog feeding business.

Recently I finished an experiment testing the efficiency of supplement feeds for the balancing of corn. Pen No. 1 was given shelled corn and the Trinity Mixture, composed of tankage 50 lbs., oil meal 25 lbs., and alfalfa 25 lbs. They were allowed free access to this in a feeder and were given all the shelled corn they would clean up three times a day.

Pen No. 2 was given shelled corn and a supplement, containing Hoosier Mineral, which is composed of 40 lbs. tankage, 20 lbs. oil meal, 20 lbs. alfalfa, and 20 lbs. Hoosier Hog Mineral. This was placed in a self feeder and the hogs allowed free access.

Pen No. 2, or the Hoosier Mineral Supplement, put on 2 lbs. per day for 77 days at a cost of $5.22 per cwt. Pen No. 1, or the Trinity Mixture, put on 1.90 lbs. per day for 77 days at a cost of $6.25 per cwt. This, figuring corn at 80c per bushel and both supplements at $70.00 per ton.

I have fed hogs in many ways, but I have never been able to surpass yellow corn and the mineral supplement. It has been used against many commercial supplements on the market and they all fall before it.

I am now running an experiment with ground wheat against corn. I will be glad to answer any questions relative to the above article, as I realize we as veterinarians need to know more about the feeding business, as a part of our preventive medicine.

Greenwood, Ind. E. E. Clore.

So Called Nervous Type Canine Distemper*

By ASHE LOCKHART, Kansas City, Mo.

In the August, 1925, issue of VETERINARY MEDICINE, the writer and associates, J. D. Ray and J. S. Barbee, reported the results of several years work with canine distemper, resulting in the development of hyperimmune serum prepared from the blood of dogs.

At the 1926 meeting of the American Veterinary Medical Association the writer presented a report "Some Phases of Canine Distemper" which dealt with the incubation period, development, symptoms, lesions and complications of this disease. This report was published in the *Journal of the American Veterinary Medical Association* in January, 1927. A few months after the last named report was read, Dunkin and Laidlaw published a report corroborative of all essentials of our report.

In considering the so-called nervous type of distemper, it is essential that the development of true filtrable virus distemper should be taken into consideration. The above reports show beyond a doubt that true filtrable virus distemper is an acute febrile disease, characterized by rapid loss of condition, inappetence, debility of the patient, running a course of approximately five weeks from exposure and caused by the filtrable virus of Carré. It should be borne in mind that this is the uncomplicated type of distemper. In the writer's opinion it does not often occur under ordinary conditions, and when it does occur may escape recognition.

The great majority of cases of distemper become complicated and it is probably true that the complications become more important from a standpoint of prognosis than the original disease. In true filtrable virus distemper the early rise of temperature, followed by a recession to practically normal, with recurrence of fever in approximately ninety-six hours after original elevation of temperature, constitutes the most constant manifestation of the disease. In cases of exposure to ordinary distemper virus, the primary rise of temperature comes approximately seven or eight days after exposure to infection; consequently, the secondary rise of temperature occurs at the eleventh or twelfth day following exposure, and on observations, covering several thousand young dogs, obtained from districts where distemper was not prevalent, we have failed to observe nasal discharge, coughing, dysentery and nervous manifestations until several days after the secondary rise of temperature. In no case have we ever observed nervous manifestations until at least twenty-one days after exposure to the virus of distemper.

Having observed the regularity of the development of filtrable virus distemper, and the comparative regularity of the development of those symptoms and lesions, which are usually classed as certain types of distemper, we were led to undertake a study of the various types of distemper with a view to determining their true nature. After several years study and observation we became convinced that the so-called types of distemper are dependent upon secondary infection, and in reality are complications of the true filtrable virus disease. It has also been our observation that under certain conditions these infections, which are ordinarily secondary, become primary and may occasionally produce disease without the

* Presented at the 40th annual meeting of the New York Veterinary Medical Society, Ithaca, Sept. 15-16, 1930.

assistance of the filtrable virus of distemper.

Of the various complications of canine distemper, it is perhaps true that the so-called nervous manifestations are the most important, especially from the standpoint of prognosis. In some localities as much as 50% of all cases of distemper eventually develop nervous manifestations and in these localities 75% or more of such cases prove fatal. Early in our study of these nervous derangements we observed with regularity a peculiar organism, this being found to be particularly abundant in the fluid contained within the lateral ventricles of the cerebrum. During the early part of our work, as reported in 1926, we experienced considerable difficulty in studying this organism, because of its sparse growing characteristics and the difficulty of keeping it alive on artificial culture media. This organism may be classed as either a diplococcus or short chained streptococcus. It is pleomorphic and rather irregular in its action toward Gram stain. Injected into perfectly healthy dogs, known to be immune to distemper, it may produce abscesses, but does not produce typical symptoms and lesions of so-called nervous distemper. However, if a young dog is exposed to distemper and, at the time of primary rise of temperature, is inoculated with pure cultures of this organism, these nervous derangements result in more than 80% of cases. It has also been observed that inoculation is sometimes successful in dogs which have been devitalized by other causes, such as excessive parasitic infestation.

Everyone engaged in small animal practice is familiar with the so-called nervous type of canine distemper and no attempt will be made to describe its symptoms. The gross lesions presented are thickening and congestion of the meninges, excessive fluid within the lateral ventricles and surrounding the spinal cord, this fluid being somewhat cloudy in appearance. In addition endocardial hemorrhages are almost always present. Microscopically changes within the brain substance are noted, especially degeneration of motor nerve cells, with the occurrence of cell inclusions somewhat resembling Negri bodies. These cell inclusions may be differentiated from Negri bodies rather readily because they show no granules when stained by the usual methods.

Dr. S. R. Johnson, working independently from the writer, has observed and worked with the same organism, in a similar condition occurring probably as a primary disease in foxes, his work having been done in 1926 to 1929. In May, 1929, the writer, and Dr. S. R. Johnson, undertook some experimental work with a view of controlling this condition, and the work done along this line since that time has been done by the writer, Doctor Johnson and Miss Caroline Dean. It has been cooperated in by a number of small animal practitioners in various sections of the United States. Studies of the organism have been made with a view to preparing an anti-bacterial serum capable of favorably influencing the course of this disease. This work is still in progress and will require some time for completion. The results of preliminary experiments clearly indicate that it is possible to produce from dogs a serum relatively potent for combating this infection.

Prior to June, 1929, we experienced in our establishment considerable difficulty in controlling this type of distemper. At that time routine immunization of distemper cases, with a product prepared from this organism, was put into practice. During the first part of the routine immunization, considerable difficulty was experienced because of abscess development. More recently this has apparently been overcome. Whether it is a coincidence or whether it may be attributed to the use of this material, it is a fact that since June, 1929, in more than 800 dogs, we have had only three cases of this condition develop. Prior to that time, in a similar number of cases of distemper,

handled in the ordinary way, we would have expected at least 300 abscesses.

As previously stated, a number of practitioners have cooperated with us in this work. Reports from these veterinarians are incomplete, but apparently show marked benefit from this material, especially when it is used as an immunizing agent, and apparently it has favorably influenced the course of the disease in those cases treated early. This work has not progressed far enough for us to feel justified in placing this material on the market, but we are of the opinion that the work with it so far is sufficiently encouraging to justify further study.

Summary

1. True filtrable virus distemper is a characteristic febrile disease.

2. In our opinion the so-called nervous type of distemper is usually a complication of the true filtrable virus disease, and is produced by a specific microorganism.

3. The control of this type of infection is dependent upon preventing contact with the specific infection, or immunization of the patient against this type of infection.

It is instructive to watch Doctor DeVine examine the genital organs of a cow at a veterinary clinic. His long thin arms are adapted to this work and he possesses to a high degree the knack of not exciting resistance on the part of the patient. This is important. It not only facilitates the operation and shortens the time required but makes a fine impression on the onlookers, particularly on the owners of valuable cows.

4. Preliminary studies of methods of immunization against so-called nervous complications of distemper are encouraging, but before definite conclusions are reached, considerably more time and experimentation is necessary.

PARALYSIS DUE TO PRESSURE OF FETUS

Will you give me a little light on the following case: I had a cow go down one month ago, without any apparent cause. She is due to calve most any time. The paralysis is seemingly in the hind legs. She can sit up in front on her front legs, but has no power to use her hind legs.

She is healthy and in good flesh, appetite is fairly good. She was noticed in the evening to be a little staggery behind and the next morning she was down and has never been up since and the paralysis seems to be more pronounced of late.

This cow is a middle-aged animal and so far as the owner knows has had no injury of any kind.—G. L. S., Iowa.

Reply:—Barring a fracture, I suspect that the cow you describe is suffering from what is known as ante-partum paralysis.

If the calf has lodged on some of the nerves that supply the hind legs and numbed them, so to speak, the cow is pretty apt to remain down until she calves; but if there is no fracture, you need have but little concern about her. She will probably recover promptly after calving. It would be quite different if it were five or six weeks before it was time for her to calve.

Keep her well bedded and keep her comfortable by turning her on her belly and sternum. Caution against turning her on her back. Also caution against drenching her except under your immediate supervision.

Feed sparingly on succulent, laxative food.

If it is necessary for you to do something to satisfy the owner or caretaker, a little tincture of nux vomica, say three times daily, will do no harm.

If she does not get up shortly after calving then, of course, other causes should be looked for.—J. F. D.

The Possibilities That Grain Sorghum Smuts Are Poisonous

By L. H. PAMMEL, Ames, Iowa

THERE has long been a suspicion that certain smuts are toxic and much has been written on the subject. Dr. V. G. Heller, Charles Caskey and Robert Penquite have recently made a valuable contribution in the study of the toxicity of grain sorghum smuts.[1] These writers make the following interesting statements: "The grain sorghums have proved to be especially adapted to some of the more arid sections of this country where they are grown and fed in large quantities to livestock. Unfortunately, many members of the group are subject to kernel smut infections. These infections can be partially avoided by proper treatment of the seed with copper carbonate or other fungicides, but the treatment is often omitted, with the result that in some years as high as 70% of the heads in certain fields are affected. In the same sections of the country the small grains are often attacked by the fungus ergot, which is distinctly toxic to livestock. When the dried heads are handled or threshed, the smut sports are liberated in the form of a very fine dust. The writers have noticed peculiar physiological reactions upon its inhalation. The upper pulmonary tract was sensitive to the passage of air, the heart action seemed to be increased, these symptoms being followed a few hours afterwards by headache and a partially nauseated feeling. For these and other reasons, it has been thought that deleterious results might be associated with the consumption of smut spores. Livestock feeders have often hesitated to use feed thus affected, and when death did occur among cattle, it has been attributed to this cause."

The work is so important that I am quoting at length some of the material from the publication: "Having demonstrated under carefully controlled conditions that the smut spores seemed to have no ill effect on small experimental animals, it was next desirable to observe the effects on farm animals as fed under farm conditions, or when the rations were somewhat inadequate, as is often the case under these conditions. A farmer was found who had broadcast his sorghum seed. The sorghum plants were somewhat thick, the heads were small, and fully 70% of them were smut-infested. The entire plant was cut and bound, the seed and smut remaining in the head, and fed to horses, milch cows, and young cattle. The horses were mature animals used for farm work, and received only the sorghum fodder, including the smutty heads, together with yellow ear corn, salt, and water. After 12 weeks of such limited diet, no ill effect could be observed. During the greater portion of the time the horses were used for heavy hauling.

The milch cows were fed a pound of soybean meal a day, as much of the sorghum fodder as they desired, together with salt and water. Nine young cattle received only fodder, containing the smutty grain in head, salt and water. Six of these gave birth to normal calves at the normal time. All the animals maintained themselves as well as could be expected on so limited a ration. It is thought that the tests demonstrate beyond doubt that the smut possesses no toxic principles when fed in as concentrated a form as ordinarily found in the field, and especially was this the case since the animals were fed a ration the efficiency of which was limited by the character and quantity of its proteins and vitamins. It is held to

[1] V. G. Heller, Charles Caskey, and Robert Penquite. The Possible Toxicity of Grain-Sorghum Smuts. Pp. 347-351, *Journal of Agr. Research*, Vol. 40, No. 4.

be quite generally true that when animals are receiving a somewhat inadequate ration they become more susceptible both to diseases and toxic substances than when better nourished.

Summary and Conclusions

Certain types of grain sorghums often have as high as 70% of the heads affected with kernel smuts which replace the grain.

Biological tests using rats, guinea pigs, and rabbits failed to reveal any deleterious results in growth, reproduction, and rearing of young when as high as 10% of smut spores replaced an equal amount of carbohydrates in an otherwise adequate diet.

Chickens were fed satisfactorily on rations prepared from smutty seed.

Horses, cows, and young cattle were fed smutty sorghum grain and fodder without displaying any symptoms of toxicity.

During the observation of these animals (over 50 in number) no sickness or deaths occurred. Young animals grew as well as the controls. Old animals maintained their weight. Reproduction took place at normal periods with four types of animals and neither the egg production of hens nor the milk production of cows was altered by feeding sorghum smut in a form as concentrated as it occurs in the field. This was true with larger farm animals even when their ration was somewhat inadequate."

RINGWORM, VARIOLA OR ?

I am having trouble with two pure-bred Guernsey cows that were imported some thirty days ago from Wisconsin.

They have broken out with some kind of trouble on the udders, and in one cow it has now spread to include the inside of both hind legs down to and including the hocks on all four feet and nose. The other cow's udder is completely raw including teats.

So far, no treatment I have tried has been of any benefit. It is in no way like foot- and mouth disease, vesicular stomatitis, gangrenous dermatitis. I have seen plenty of these diseases and am confident the trouble is different. Am wondering if other readers of VETERINARY MEDICINE have had cases of this nature.—A. W. F., Wyoming.

IT'S ALL IN A LIFE TIME

The article under the above title by Dr. G. U. Marchand in the September issue of VETERINARY MEDICINE is of interest as these conditions have been experienced by all of the older practitioners. Unfortunately there are two kinds of people, reasonable and unreasonable; one makes a satisfactory and profitable client, the other an unsatisfactory and unprofitable client. The one class needs cultivation, the other weeding out.

It has been my experience that a dissatisfied client is the greatest liability that a practitioner can possess. So, when one is developed it is necessary that ways and means be devised to get rid of him. This may be accomplished in many ways. It should be done quietly and efficiently so that no one except the party in question be offended. One may be busy when he calls or may charge him more than his neighbor, then push him in the collection of the bill; keep after him until he wishes his unreasonableness on to somebody else.

In a case like Doctor Marchand refers to, where a discourtesy or "slam" is implied, it is well to remember that silence is golden, but at the same time, keep alert and head off any attempt that he may make at next opportunity. Keep this kind at a distance, be civil, but not friendly with them; try to have as little to do with them as possible and one will be money ahead at the end of the year.

We meet another class, the man who comes around a year or two after contracting a bill and asks for a reduction; or refuses to pay because of unsatisfactory results with animals treated. With these when they occur, I listen to their story patiently, letting them do all the talking; when they have run down, I agree to their proposals if humanly possible, suggesting that I might meet their wishes under *one* condition—that being that they will NOT ask me to do any more work for them. I explain that dissatisfied clients will ruin any man, both professionally and financially, and while I had failed to satisfy him, he might get on better with somebody else.

The point I wish to make is that a veterinarian, like every other business man, must draw a line between accounts that are an asset and accounts that are a liability. Any success that I have had is at least in part due to my insistence upon distinguishing between a winning and a losing proposition; in other words, between paying clients and losing clients, and I am absolutely sold on the idea that a dissatisfied client absolutely and positively loses a veterinarian money.

His influence on other clients is bad and he takes up time that could be better employed elsewhere.

One cannot serve a client to the best of one's ability if one does not have his confidence and good will. For twenty years, it has been an iron clad rule with me not to have the name of a dissatisfied client on my books. When one develops, he is disposed of by the easiest and quietest way possible before he influences a good client against me. Henry Hell.

Wilton Junction. Iowa.

"GIVE TO THE WORLD THE BEST YOU HAVE"

It is safe to say that an earnest desire to better his conditions plays a major part in every individual's ambitions. And yet, many a man struggles doggedly on without making the desired headway, never realizing that he is encountering such difficulties because he does not, or has not even the desire to give the best that is in him. In his blindness he cannot see that the mistake he is making is in expecting the best from the rest of the world in exchange for his half-hearted, mediocre mere "something."

Giving a bit of time to self-examination we find that this is true with many of us. When rendering a service, do we always give the very best service it is possible to give? Do we give full measure, pressed down and running over? If we are honest with ourselves we will have to admit that many times we measure rather stintingly, and give even that stinted measureful grudgingly. We "slide along" as it were, doing only as much as we can do easily without any special effort.

There is a story of a young book salesman who tried to sell an encyclopedia on scientific farming to the owner of what appeared to be an old broken-down farm. The weather-beaten old shack that served for a house was badly in need of repairs, and the barn had long ago passed into a state of decay. An old worn-out cow, a couple of stray pigs, and some scrawny hens roamed about a make-shift pump.

Thinking that the owner was a victim of circumstances, the salesman began to explain to this farmer that the information contained in the book he was selling would help him to adopt better methods, improve the condition of his farm, his crops, and likewise increase his profits. The old farmer, after listening for "a spell," shifted his position so as to throw his full weight upon the tree against which he had been lazily leaning, then gave vent to a long-drawn-out yawn and said, "Young feller, I ain't farmin' now as good as what I knows how."

So it is with many a man who feels sorry for himself for not being able to enjoy all the benefits life has to offer. He simply "ain't doing as good as what he knows how." It should be the sincere ambition of every practicing veterinarian to do the best possible work that any veterinarian is capable of doing. A high ideal is an interesting thing—it will stimulate to greater and greater endeavor the man who cherishes it. When lofty ideals and aspirations are carefully lived up to, not only will the one who believes in them increase more and more his capacity for rendering greater and more valuable services and thus lift himself into higher and higher stations in life, but his influence will be felt by all his brother practitioners, and the whole profession will be brought to a higher level.

Highland Park, Ill. Carleton Cleveland.

In addition to pullorum disease, which is of outstanding importance in the poultry industry, blackhead, infectious bronchitis, coccidiosis, and roup deserve the special attention of poultrymen.—J. R. Mohler.

A. V. M. A. Tour of Europe

By A. T. KINSLEY, Kansas City, Missouri

A PARTY consisting of seventy-two, of which twenty-eight were veterinarians, under the direction of Mr. Dore Walten of the Beaux-Arts Tours, and Dr. A. Eichhorn, sailed from New York on June 13th, 1930. The following observations, we believe, will be of interest to veterinarians throughout America.

Equine Practice Important

Relatively more draft horses are in service in the cities in Europe than in the United States. In Paris it was noted that many stallions are used for draft purposes. Although many horses were observed on the streets in Italy, they were not so common there as they were in Paris. We found the horse still in service on buses in parts of Switzerland and a tally-ho service for tourists in the Trossachs of Scotland. Considerable numbers of horses of fair quality were noted to be used for draft purposes on farms, particularly in Hungary, Austria, Czechoslovakia and Germany. Many splendid draft horses were hauling large loads on the streets of Amsterdam and also in Brussels.

It was interesting to learn that in the last few years several cases of tuberculosis have been observed in the horse, particularly in Germany and other regions where all feeds were drafted for war purposes. The cause of equine tuberculosis was said to be due to the feeding of cow's milk to colts during the war.

Swamp fever is relatively prevalent in Germany and some parts of Belgium. A unique method of diagnosis of this malady, according to Dr. Oppermann of Hanover, was the introduction of a trocar direct into the liver and by means of a circular knife, the removal of a section of the liver, which was subjected to various laboratory tests, the findings of extra quantities of iron being indicative of the presence of swamp fever. Prof. Oppermann indicated that a preparation of antimony was being successfully used in the treatment of this malady.

In general, there is a shortage of horses, particularly in the better farming sections of all countries of Continental Europe. That horses are a relatively important factor in veterinary practice is indicated by the fact that in Vienna Veterinary Colleges from six hundred to seven hundred equine surgical cases are cared for each year. It was not an unusual sight to see one horse hitched to a wagon with a pole on one side. In other instances, an ox and a horse were worked as a team. The majority of dairy vehicles were two wheeled carts with shafts.

Breeds of Cattle

Some breeds of cattle were observed that were of special interest. The Bretange breed of cattle are of Normandy origin. This is a large type, red and white spotted, contour similar to our short horn and our dual purpose cattle. Many of these were observed in France. The Charolaise are solid white cattle. This type of cattle was said to be derived direct from the wild oxen and the progeny has been maintained in France as their laws, until recent years, prohibited exportation of any of these animals except to French colonies. These cattle are very large and it is claimed that baby beef from eight to twelve months of age of this breed weighs from 1200 to 1400 pounds. They are also a dual purpose cattle.

Simmenthal cattle were observed in Switzerland, Austria and Germany. The origin of these cattle we did not ascertain. They are large, yellow spotted cattle and in Switzerland are said to serve four purposes, namely, milk, cheese, meat and draft purposes. Several individuals of the Simmenthal breed were observed in the Dresden market. Each of the animals would weigh 1600 to 1800 pounds.

Montafou and Prizgau, two other breeds of cattle that were observed in Austria and Germany and parts of Switzerland. They are perhaps derivatives of Brown-Swiss. Aside from the above mentioned cattle, there were observed Jerseys, Holsteins, Guernseys and Dutch belts, Holsteins predominating in Holland. It was interesting to note that in many instances cows apparently in the lactation period were used for draft purposes. European cities are not quite as esthetic as are the American cities, thus in the city limits of Vienna it was claimed that there were approximately 5,000 milk cows.

This fine Belgian was hitched to a wagon loaded with two and one-half tons of coal. The photograph was taken on the streets of Cologne, Germany, and shows a common custom of hitching horses single with a pole at one side instead of shafts

Swine and Their Ailments

Very few swine were observed excepting in Hungary and Germany, where slightly different breeds of hogs were noted. The accompanying illustration shows the type of hog known as the Hungarian hog that are used in serum production in the Budapest serum plants.

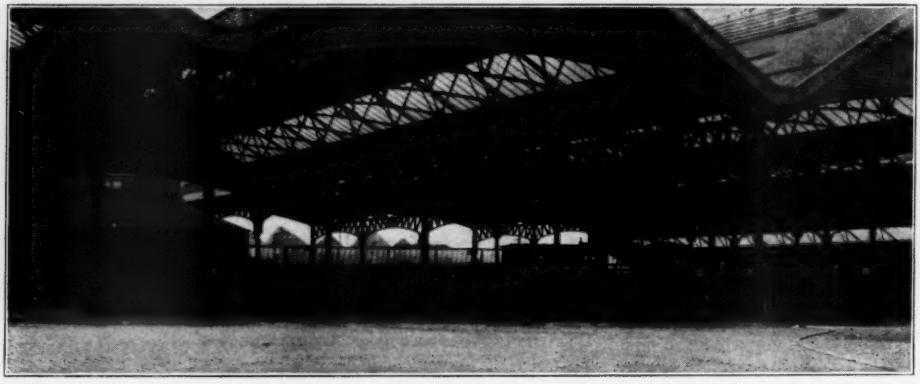
Erysipelas is a relatively prevalent disease in swine throughout Europe. In fact, it is claimed to be of greater importance because of its prevalence than is hog cholera. Erysipelas usually assumes a septicemic form and is quite fatal. Typhoid or suipestifer infection is also relatively prevalent and exacts its toll particularly in the pigs soon after weaning. The simple method or serum alone is practically the only method of protecting against hog cholera. Considerable numbers of hogs are immunized each year, particularly in Germany and Hungary, but the loss is quite heavy because of the fact the passive immunity produced by the serum alone is insufficient for protection.

Dogs Plentiful

Every continental country in Europe possesses an abundance of dogs. In fact, dogs are apparently more plentiful in the European countries than they are in America. In Vienna, according to tax reports, there are approximately 96,000 dogs. In many of the cities, dogs are in draft service. The accompanying illustration evidences the dog hitched to a dairy cart. This type of vehicle was very common, particularly in Brussels. There was observed at one small vegetable market, twenty-one dog carts parked side by side with the dog hitched and ready for service. Small animal practitioners in Europe as in America, seem to have a splendid business.

Milk delivery in Brussels, Belgium. The dog is frequently hitched under the cart instead of in front of it

Tuberculosis is relatively prevalent in dogs. According to the records, there were 300 tubercular dogs presented at the clinic of Berlin Veterinary College during the last year. Eighty per cent of all police dogs in Vienna are said to be tuberculous. This malady is also very prevalent in dogs in Brussels.



Public Stock Yards, Edinburgh, Scotland

Parasites and canine distemper are apparently the cause of much loss of dogs and are of great concern to the small animal practitioner.

Foot-and-Mouth Disease

The control of foot-and-mouth disease is apparently one of the important problems of all sanitary officials throughout Europe, including the British Isles. The plurality of virus of foot and mouth disease has been demonstrated beyond question. In Italy it was claimed that by the use of serum from animals that had recovered from an attack of foot-and-mouth disease, and virus from guinea pigs and other experimental animals, the control of foot-and-mouth disease was not difficult. However, it was conceded by this method that it was not possible to eliminate the disease. This same general method of treatment has been carried on in some sections of Germany, using the simultaneous method in diseased herds and serum alone on exposed herds, and by these methods of treatment there was a saving of at least 6 per cent of the cattle, as it was claimed that 3.6 per cent of cattle vaccinated died and 9.6 per cent of the cattle not so vaccinated died. The spread of foot-and-mouth disease was thought to be possible, according to German investigators, by virus carriers; the animals themselves probably never showing any evidence of the disease.

Type of swine used at the Budapest Serum Plant and common in Hungary

Infectious Abortion

The control of abortion disease was found to be of as much interest and importance in foreign countries as in the United States. At the Milan Veterinary College in Italy, their records showed the treatment of approximately 30,000 cows and heifers by the use of a vaccine made from recently isolated cultures. In other words, the vaccine used was made from cultures obtained from infected animals in the same district. The use of this vaccine was apparently of considerable value, particularly in heifers, and in cows that were vaccinated prior to breeding. It was interesting to note that the cultures used in a preparation of this vaccine were of virulent organisms. The vaccine was injected into the skin of the tail.

Dr. Kovey, Director, Budapest Serum Plant; H. E. Curry, Kansas City; A. T. Kinsley, Kansas City; Dr. Moisby, Budapest. The vine covered building in the background is a part of the State Serum Plant in Budapest. The tourists can be told by their canes. They always have them

Austrian investigators believed that some beneficial results have been obtained by the use of abortion bacterin and vaccine and particularly when two doses, the first consisting of 10cc and the second 20cc of vaccine made from recently isolated cultures are used on heifers and unbred cows.

Hungarian veterinarians did not have any definite plan of control for abortion disease in cattle, although they conceded that the disease was very prevalent and of very great economic significance.

Investigators in Germany contended that abortion vaccine produced an increased resistance to abortion infection. Some of the German investigators were of the opinion that an occasional carrier may result from the use of vaccine; however, this is of little significance in that country, as very few cases of undulant fever had been identified and there is little danger from milk infection in any European country because practically all milk is boiled before it is used. Several outstanding German investigators and some practitioners stated that the control of abortion disease in Germany by the segregation or elimination of positive reactors to the agglutination test was not practical and recommended the use of vaccine particularly in infected herds.

Belgium regulatory officials recommend the removal of positive reactors to the agglutination test in herds where less than 15 per cent are positive reactors and the use of vaccine in herds where 15 per cent or more are positive reactors. This disease was discussed at length in VETERINARY MEDICINE in abstracts of papers presented at the International Veterinary Congress.

Bovine Mastitis

Control and treatment of mastitis is one of the important problems of the veterinarian throughout Europe. This malady is apparently very prevalent. Considerable investigational work has been done as to the cause and method of prevention.

Streptococcus, diphtheroids, colon bacilli and staphylococcus are the usual causative agents. Some are of the opinion that the disease can be quite effectively controlled by vaccination with a vaccine containing the organisms responsible for the production of mastitis in the herd in question. Vaccination prior to calving was claimed to be of considerable value, particularly if two injections are given.

Sheep production is apparently rather unevenly distributed in Europe. Many bands of sheep were observed on the low lands in Holland. These sheep were splendid in-

dividuals and were in first-class condition. The grazing of sheep in America on such low lands as those of Holland would be a difficult task because of parasites, but it was learned that sheep in Holland are not infested with stomach worms, at least to a degree that will cause any clinical manifestations and, after making inquiries, it was learned that possibly the explanation of the absence of parasites in Holland is due to the brackish condition of the water and possibly the deposition of small quantities of salt from fog and dew. Tens of thousands of black-face Highland sheep were also observed all over the moorlands and hills in Scotland. These sheep are apparently healthy and according to livestock commission men in Edinburgh, they have little difficulty with parasites. They run on pasture till late August and then are turned on "foggle," fields where oats and barley have been harvested and receive some beets, turnips or other tubers. They are finished for market without grain.

Poultry

Poultry is produced in abundance in practically all of Europe. Various maladies common in the United States are also prevalent in European countries. In some locations large flocks of ducks and geese were observed. Discussion of poultry diseases by several eminent European veterinarians were published in VETERINARY MEDICINE last month.

Veterinary colleges were visited in every country excepting Czechoslovakia. Many of these institutions are equipped to give splendid courses of instruction. In some institutions better equipment is found than exists in any of our American colleges. Germany is supporting four veterinary colleges, and has over 1200 veterinary students and it would appear as though they are anticipating a demand for veterinary service in

The A. V. M. A. European Tour Party in Berlin. All but one of the ladies (who comprised 60 per cent of the A. V. M. A. party) were sightseeing elsewhere when this photograph was taken at the Reichsgesundheitsamt. Those in white gowns are officials and employes of the National Health Bureau. Dr. E. Wehrle (No. 35), is director of the Veterinarabteilung. Dr. D. S. White No. 4) was not on the tour, but visited the party in Berlin. 1. Kelly; 2. Stange; 3. Lenfestey; 4. White; 5. Derrick; 6. Schalk; 7. Bergman; 8. Buckley; 9. Hart; 10. Outhier; 11. Moser; 12. Helm; 13. Frl. Wernicke; 14. Zeller; 15. San Miguel (Chile); 16. Cotton; 17. Hayes; 18. Dobbs; 19. Frl. Mohr; 20. DeVine; 21. Crespo (Cuba); 22. Smith; 23. Ackerman; 24. Stein; 25. Kinsley; 26. Sunderville; 27. Eichhorn; 28. Gaggermeier; 29. Beaudette; 30. Schlofsberger; 31. Heininger; 32. Bierman; 33. Biauchini; 34. Eichhorn; 35. Wehrle (Director Veterinary Division); 36. Lonstein; 37. Mohler; 38. Volgenau. Home addresses were given in the October issue, Page 408.

the future. It is evident by the growth and development and present maintenance of veterinary colleges in Europe that it is expected that the veterinary profession will continue for an indefinite time to come.

The success of the professional tour in Europe must be credited largely to Doctor Eichhorn, who took so much interest and pains in ascertaining every wish of each and every one of the veterinarians. After having observed general conditions under which veterinarians make their livelihood in various European countries, the writer is more than glad that he is one of the veterinarians in the United States.

THOROUGH DISINFECTION IS ESSENTIAL FOLLOWING THE REMOVAL OF REACTORS FROM INFECTED PREMISES

I am satisfied that to eradicate tuberculosis from a herd, it is essential to instruct owners of the necessity of thorough cleaning and disinfection after they have disposed of their diseased animals. Owners very often wonder why they continue to have reactors uncovered in their herds following the initial test. This is very often caused by not taking sufficient care to remove old floors, mangers that are beyond repair and partitions that are badly infected from being in contact with diseased cattle for some time.

Owners are often careless about proper cleaning of barn yards, hog lots, and poultry yards which may be badly infected and will often infect healthy cattle.

Instructions to owners following the removal of reactors:

All reacting animals must be removed from the herd and slaughtered at once.

All manure and litter should be removed from the stable and barn yard and from other buildings that might be used for the storing of manure or other infected materials.

The barnyard should be scraped and cleaned and a good coating of dry lime applied to it.

Proper drainage from the stable and yard should be established.

The cow stable is the place where you should be very particular about proper cleaning and disinfection. Sweep down all cob webs and accumulations of dust, dirt, etc., from the walls and ceilings.

Where flours are old and planks are showing evidence of decay, it is well to remove them completely with the mangers and partitions and replace with steel stauncheons and drinking bowls. A new cement floor might seem expensive, but it gives satisfaction and very often avoids future loss of cattle.

The walls should be scraped with a sharp hoe and washed with hot water and lye.

In cases where you are going to use the original floor and mangers, it is a good procedure to scrape thoroughly and wash with hot water and lye the same as the walls. Following this, the whole interior of the stable should be thoroughly whitewashed, a disinfectant used of standard strength, taking care to get the solution into cracks and crevices where infection may exist.

If the above precedure is carried out, the owner can feel that he has done his part toward eradicating tuberculosis from his premises.

St. Lamberts, Que. M. I. L.

According to estimates the annual production of rabbit meat in Southern California exceeds 6,000,000 pounds. In addition to this, California annually imports from 200 to 250 tons of rabbit meat. In addition to the meat rabbit fur is a very important item. There is an annual importation into the United States of over $20,000,000.00 worth of rabbit fur.—California Cir. No. 19.

The average farm hen in the United States lays 60 eggs a year. Experiments testing the influence of artificial lighting have been carried on at various places and in general it has been found that the artificial lighting does not cause an increase in the annual egg production, but does result in an increased production during the fall and winter months when egg prices are usually high.—Farmers Bul. 1524.

Standardization of Veterinary Biologics in the United States*

By JOHN R. MOHLER, Washington, D. C.
Chief, Bureau of Animal Industry, U. S. Department of Agriculture.

The Necessity of Control Measures Recognized

PRIOR to the enactment of the Virus-Serum-Toxin Law, applicable to veterinary biologics, the Bureau of Animal Industry was reminded frequently of the urgent need not only for controlling the importation of these products, but for their preparation and distribution within the United States. The discovery that vaccine virus imported into the United States was responsibile for outbreaks of foot-and-mouth disease showed conclusively that contagious and destructive animal diseases could be introduced into a country by the importation of viruses, cultures of organisms or by serums derived from animals. Recognition of this situation led Dr. A. D. Melvin, then Chief of the Bureau, to recommend in his annual report for 1908, "That Congress enact a law prohibiting the importation, except with the permission of the Secretary of Agriculture, of any virus that may be infectious for domestic animals."

Testing of Biologics Authorized by Congress

The Congress in the appropriation bill for 1909 authorized the Department of Agriculture "To purchase in the open market samples of tuberculins, serums, antitoxins, or analogous products of foreign or domestic manufacture which are sold in the United States for the detection, prevention, treatment, or cure of diseases of domestic animals, to test the same, and to publish the results of said tests." Under this authority Dr. A. Eichhorn, then a Bureau bacteriologist, and the writer investigated the potency of tetanus antitoxin prepared in the United States for the treatment of domestic animals. This was done because it had come to our attention that the product as marketed by some firms was unreliable and in other cases possessed a very low standard of strength. These investigations showed that there was a great lack of uniformity as to the potency of tetanus antitoxin prepared for veterinary use. In some instances the variation amounted to about two-thirds less than the strength which the product should have possessed. In a comparison of samples of veterinary tetanus antitoxin with antitoxin prepared for human use the latter was found to be more reliable and more accurately standardized (B.A.I. Bulletin No. 121). The Bureau also tested samples of an imported hog-cholera vaccine and samples of hog-cholera and swine-plague serum, and neither was found to be reliable for the protection of hogs against cholera. A domestic preparation widely advertised and sold as a serum for the prevention and cure of abortion disease in cattle was examined and found to be not a serum at all but a weak solution of carbolic acid (Office of the Secretary Circulars 27 and 29). In another instance, diphtheria antitoxin, which had been returned to the producer because its date of usefulness had expired, was relabelled as antitoxin for equine influenza, chicken roup, dog distemper, etc. In another case a producer was making a so-called tuberculin from cultures of a non-pathogenic, acid-proof bacillus. In tracing the origin of the infection of the 1908 outbreak of foot-and-mouth disease in the United States it was learned that some calves that had

* Presented at the 11th International Veterinary Congress, London, August, 1930.

been used in a biologic laboratory in propagating smallpox vaccine were the first to develop the disease. This suggested that the vaccine which was used on the calves might have been contaminated with the virus of foot-and-mouth disease. Since the United States Public Health Service had supervision of biologics produced for use in man, that service was requested to join the Bureau in making an investigation. Dr. Milton J. Rosenau, Director of the Hygienic Laboratory, and the writer undertook the investigation which proved that the smallpox vaccine in question was the cause of the outbreak (B.A.I. Circular 147). The fact that an outbreak of foot-and-mouth disease in Massachusetts in 1902 appeared first near a biologic laboratory suggested that in all probability this outbreak also originated from contaminated smallpox vaccine. The importing licenses issued by the U. S. Public Health Service to the involved firms were at once suspended and all of the contaminated and suspected vaccines were destroyed.

Abuses of Anti-Hog-Cholera Serum

The discovery by de Schweinitz and Dorset in 1903 that hog cholera is caused by a filtrable virus led to experiments which had for their objects the development of a protective serum against hog cholera. By the close of 1905 it had been demonstrated that hogs could be protected from hog cholera by the use of a hyper-immune serum, either alone or simultaneously with hog-cholera virus. Following demonstrations of proof of this during the years 1905-1907, notices of the Bureau's findings were sent to each of the States of the Union inviting a representative to the experimental farm maintained by the Bureau at Ames, Iowa, in order that they might observe the methods of serum production in actual operation and have explained to them the exact methods of application. Attention of swine growers and others was directed to the advantage of treating swine with the newly developed serum. State officials and others co-operated with the Bureau in making practical demonstrations of the advantages of this treatment. The result was a rapid demand for the product which stimulated its production in several different commercial establishments. Demand and profits increased to such an extent that unscrupulous persons began selling serum as well as other biologics that did not produce satisfactory results, and in many cases proved disastrous. Serum and virus were sometimes prepared in pens of stockyards and in other equally objectionable places. In other cases, normal defibrinated blood derived from animals slaughtered for food purposes was sold as anti-hog-cholera serum. These practices not only were disastrous to live stock producers, but rapidly were discrediting serum and other meritorious biologics. Representatives of the different State live stock sanitary associations and others in authority soon recognized with the Bureau that existing conditions were serious and that control measures must be applied.

The Virus-Serum-Toxin Law

In appropriating funds for the Department of Agriculture for 1914 the Congress incorporated in the Bill a paragraph authorizing the Secretary of Agriculture to supervise the production and distribution of veterinary biologics entering into inter-State commerce and permitting importation into the United States of such biologics as might be of safe origin and, upon examination and inspection by the Bureau, found not worthless, contaminated, dangerous, or harmful. The Bill was approved on March 4, 1913, and remains unaltered to date. It makes it unlawful for anyone to prepare or market in inter-State commerce any worthless, contaminated, dangerous, or harmful biologic product intended for use in the treatment of domestic animals, and authorizes the Secretary of Agriculture to make such rules and regulations as he believes necessary to prevent the importation or distribution in inter-State commerce of biologics which are unsuitable for use. Veterinary biologics cannot be

marketed legally in inter-State commerce unless prepared in an establishment operating under a license from the Secretary of Agriculture or imported from abroad under a permit from the Secretary. To obtain a license or a permit formal application must be made to the Secretary, and full information must accompany this application giving details as to methods of preparing the products. Permits are denied whenever it appears that the products for which application is made may be the medium through which infections existing in foreign countries may be conveyed to animals in the United States. The law empowers the Secretary to suspend or revoke licenses or permits under certain conditions and when it appears that the license or permit is being used to facilitate the sale of a worthless, contaminated, dangerous, or harmful product.

Regulations and Inspection

The first regulations promulgated under the law became effective July 1, 1913. They were general in their requirements because of the newness of the law and the industry to which they applied. Since that time the industry has expanded enormously and experience in controlling the preparation and distribution of biologics has necessitated the issuance of more comprehensive regulations and specific instructions. The present regulations were made effective November 1, 1922, and contain the form of permits and licenses and deal with the numerous problems involved in the control and standardization of biologics and establishments in which they are produced. The regulations cover construction and sanitation of establishments, methods of preparation, identification of products, return date, labelling, and many other phases of production and control. All products must be labelled in conformity with the Food and Drugs Act as well as the Virus-Serum-Toxin Act.

On account of the great economic importance of anti-hog-cholera serum, both from the standpoint of producers and the live stock industry, and because of abuses to which it may be subjected, more attention is given to the supervision of plants producing this product than to those producing other biologics. The supervision of it is also more intensive because both hog-cholera serum and virus became contaminated with foot-and-mouth-disease virus in 1914, at which time the latter disease was widespread among cattle and hogs in the United States. Certain batches of both hog-cholera virus and serum prepared by two commercial establishments became contaminated and served to cause foot-and-mouth disease among hogs that were vaccinated for hog cholera. This occurrence brought home forcibly the necessity for producing hog-cholera serum which could be rendered free of all danger of foot-and-mouth disease and similar infections, and for omitting no reasonable precautions to prevent a similar disastrous experience.

Accordingly, in plants in which serum and virus are prepared a personnel of 100 employes devotes its entire time to inspecting the animals used and supervising operations and methods of preparation and testing. About 60 of these employes are veterinarians, the remainder being laymen and clerks. Members of this organization also, from time to time, make periodic visits to those plants preparing biologics other than virus and serum. The force in each region operates under the supervision of an inspector in charge, who is responsible to the Bureau for all work in his territory. The entire organization engaged in this work is known as the Division of Virus-Serum Control of the Bureau, with headquarters in Washington. The work is directed by correspondence, visits to field stations and to establishments, and through a well-developed system of reporting. Inspectors keep detailed records of their activities, and report them daily to their inspectors in charge, who in turn forward required reports to Washington. It is likewise their duty to see that a high standard of sanitation is maintained throughout all licensed establishments.

Both serum and virus are prepared in lots or large batches, each of which must be mixed thoroughly in a single container under the supervision of a Bureau employe who takes samples for testing. These tests are conducted by establishments themselves under the direct supervision of employes of the Bureau. Judgment of the results of the tests rests with the inspector of the establishment, who is guided by rules and regulations issued by the Bureau. No batch of either of these products is released for marketing unless tests show it to be satisfactory.

Samples of products other than serum and virus, together with subcultures of organisms used in their preparation, are collected by inspectors from time to time and forwarded to the Bureau's laboratories for examination. When products are found to be unsatisfactory they are destroyed under Bureau supervision. Large quantities of serum and virus are destroyed annually under this plan. Inspectors themselves apply a test to each batch of hog-cholera virus to determine its phenol content. In order to ensure that this product, when favorably stored, will remain in good physical condition until used, it must contain 0.5 of 1 per cent. phenol. Before this testing of each batch was required, disastrous results were experienced in some instances due to the low phenol content of the product. Animals treated with it sometimes developed septicemia.

Types of Anti-Hog-Cholera Serum

As originally developed anti-hog-cholera serum consists of defibrinated blood of hogs hyperimmunized against hog cholera, to which has been added a sufficient quantity of a 5 per cent. phenol solution to cause the completed product to contain 0.5 of 1 per cent. phenol. Therefore, for each 100 cc. of defibrinated blood-serum 90 cc. consists of blood and 10 cc. of solution. In clarifying defibrinated blood a little over 70 per cent. of its volume can be recovered as a clear product, which we term true or protective serum. It is estimated that defibrinated blood contains a little over 72 per cent. of this true serum, but that approximately 2 per cent. is lost in clarification. Defibrinated blood-serum therefore contains a little over 65 per cent. of true serum.

Clear serum as produced commercially is prepared by treating each 100 cc. with 1 per cent. of sterile bean extract and 3 per cent. of sterile saturated salt solution. This mixture is then subjected to centrifugation (Dorset-Henley method developed in 1916). Since the serum is composed of the clarifying and preserving solutions as well as true serum, all of these constituents must be taken into account in the completed product. We limit the quantity of completed clear serum to be produced from each 100 cc. of defibrinated blood to 84 cc., which must contain at least 84 per cent. of true serum, although this usually amounts to 85 or 86 per cent. The specified minimum dosage of clear serum is 20 per cent. smaller than that for defibrinated blood-serum. Thus animals treated herewith on this basis receive the same quantity of protective serum whether they receive clear serum or defibrinated blood-serum.

Clear serum can be heated at a temperature sufficient to destroy foot-and-mouth disease virus and other infectious agents without materially diminishing the potency. This, of course, is an important consideration. The temperature used destroys tubercle bacilli and other pathogenic bacteria should they be present, thus making it feasible to permit producers to mix the bleedings of the different animals for clarification rather than hold them separate for several weeks until a post-mortem examination can be made, as is required in preparing defibrinated blood-serum. This facilitates the handling of the blood and simplifies production methods. The product when heated is held at 59° to 60° C. for 30 minutes under the supervision of a Bureau employe, prior to preservation. The present procedure of heating involves the use of a newly-developed type of container which is submerged completely in

a water bath. The product immediately after heating is rapidly cooled to 12° C. No part of the product or the containers can escape the action of the required degree of heat. Temperatures are recorded by means of automatic recording thermometers. The resulting product either is sterile or of a very low bacterial count. This ensures better keeping qualities than can be expected from defibrinated blood-serum or from unheated clear serum. Equipment used in connection with this heating operation enables producers to handle large volumes of serum in a most satisfactory manner.

Standardization of Biologics

The desirability of standardizing the different biologics has been brought out on several occasions, and while considerable progress has been made along this line, there still remains much to be done before conditions can be regarded as satisfactory. Reasonably accurate standards have been worked out for tetanus, botulinus, and diphtheria antitoxins, while in the course of preparing rabies and smallpox vaccines tests of their virulence are made in a fairly satisfactory manner. Some sera, such as anti-hog-cholera serum, are tested fairly well on animals against fatal doses of virus. However, this does not determine the degree of potency with desirable accuracy. We require that each batch or mixture of this product be tested on at least eight pigs, all of which shall receive 2 cc. of virus and five of the eight shall receive 15 cc. of serum in the case of the clear product and 20 cc. of serum in the case of defibrinated blood-serum. Should all serum-treated pigs remain well throughout the test the product is declared satisfactory for marketing. We have a test by which the potency of the different commercial tuberculins can be compared to that possessed by standard Bureau tuberculin. Tuberculin prepared under our regulations must be labelled to show the equivalent of Koch's old tuberculin contained in each cubic centimetre, disk, etc. The dosage for subcutaneous tuberculin is not less than the equivalent of 0.5 of 1 gram of Koch's old tuberculin. Intradermic tuberculin, as marketed, usually contains twice the quantity of Koch's old tuberculin per cubic centimetre as that contained in the subcutaneous form. All tuberculin must be filtered through germ-proof filters before marketing. The immunity unit for measuring the strength of tetanus antitoxin is ten times the least quantity of antitetanic serum necessary to save the life of a 350-gram guinea-pig for 96 hours against the official test doses of standard toxin furnished by the Hygienic Laboratory of the U. S. Public Health Service. At least 1,500 immunity units should be recommended for the prevention of tetanus in horses.

In the case of bacterins, vaccines, and toxins, it is required that they be derived from the specific cause of the disease for which they are intended, or from secondary invaders of the disease. Suspensions of killed bacteria are designated as bacterins, and ordinarily outlines of methods followed by producers are essentially the same as observed in the preparation of typhoid bacterin. However, there have been instances of wide divergence from this standard, and unwarranted claims have been made as to the bacterial content of some bacterins. To prevent misrepresentation as to the content of bacterial suspensions we have encouraged cultural methods which would aid standardization without reference to the bacterial count. As a corollary to this we have favored the determination of the agglutinin response of rabbits to injections with the completed product. In this way the specificity of the product may be tested and the quantity of bacterial substance may be controlled through proper cultural processes and by refraining from excessive dilution. Nutrient bouillon now is used quite extensively for propagating cultures in the preparation of bacterins. Organisms propagated to the limit of their growth in such medium under proper conditions and when dispensed without dilution reasonably should en-

sure the stimulation of sufficient antibody response to immunize against the organisms used. In his efforts to develop appropriate standards the writer has had the unreserved support of the industry as a whole.

Growth of Biologic Industry

On January 1, 1914, soon after the Law above mentioned became effective, 24 establishments were producing biologics under veterinary licenses. At the close of 1929, 88 establishments were operating under such licenses.

We now have 17 regional offices or stations, each headed by an inspector in charge, with a personnel sufficient to supervise the work in the region assigned to him. The initial appropriation made by Congress for the control of biologics during 1914 was $25,000. Expansion of the industry with the consequent increase in inspection work has required increased funds. For the current year there has been appropriated $277,795.

The importance of the biologic industry in the United States perhaps can best be portrayed by giving the quantities of products produced. During 1929, the production of biologics other than anti-hog-cholera serum and hog-cholera virus amounted to 35,351,130 doses. Of this quantity 7,263,853 doses consisted of aggressins prepared for the prevention of blackleg, hemorrhagic septicemia, and anthrax; 1,640,477 doses of antitoxins and anti-bacterial serums; 13,635,056 doses of a number of different bacterins; 7,030,864 doses of several kinds of vaccines and viruses; 136,863 doses of mallein; 1,891,835 doses of pullorin; 605,240 doses of avian tuberculin; 3,144,652 doses of tuberculin for the diagnosis of tuberculosis in other animals; and 2,290 doses of johnin.

Of course, anti-hog-cholera serum is the most extensively made veterinary biologic in the United States. During 1915, which is the first year for which records are available, commercial establishments produced 208,571,232 cc. of serum, all of which consisted of defibrinated blood-serum. Although clear serum was first produced commercially in 1916, the first year for which separate figures are available is 1920. In 1929 a total of 992,587,074 cc. of serum was produced, 72.2 per cent. of which, or 716,737,455 cc., consisted of clear serum. To produce and test this quantity of serum, and also the virus prepared for use therewith, it required 443,880 animals. If we assume the average dose of serum used in the immunization of swine to be 50 cc., the quantity of serum produced last year is adequate to treat 19,851,741 hogs.

Liver Fluke Disease of Sheep*

By ROBERT DILL, Reno, Nevada.

LIVER fluke disease, or liver rot of sheep, has been recognized in Europe for centuries as causing enormous losses of sheep during wet seasons. Fitzherbert mentions the "flukes" as associated with dropsies and jaundice as early as 1532 A. D.

The disease has been in the United States for many years. In fact, one species of fluke, the *Distoma americanus,* seems to be native to North America while other species of flukes have entered the country in the bodies of imported animals.

Species Infested

Sheep and wild ruminants are the most susceptible, cattle a little less so, and goats a little less so than cattle. Swine and horses rarely become infested with flukes. A few cases are on record where man has died as a result of liver fluke disease.

Distribution

During the last few years, there has been a fairly rapid spread of liver fluke disease over the western sheep raising states, until it has assumed considerable economic importance.

The disease may be acute or chronic, and losses may be quite severe. It is caused by three species of liver flukes, *Distoma hepaticum* (Fasciola hepaticum), *Distoma americanus* (Fasciola magna), and *Distoma lanceolata.* Of these, the *D. hepaticum* is the most common and widespread, and is the one commonly found in Nevada. The *D. americanus* is reported to be rather common on the gulf coast and in some sections of the western coast; and less so in the intermountain country. It may exist in this state, although the writer has not found it in sheep. The third, *D. lanceolata,* if it exists at all in the United States, seems to be rather rare in the West.

In Europe, the *Distoma hepaticum* and *D. lanceolata* are reported to be sometimes present in the same host, i.e., a double infection existing in one animal.

Differentiation of Species

Flukes are flat, leaf-like worms, broader in the middle, brown in color, provided with suckers, and are hermaphrodites. The *D. hepaticum* is from four-fifths to one and one-quarter inches long, one-fifth to one-half inch wide. The *D. americanus* averages about one and one-half inches long and an inch wide, and may attain an extreme length of four inches. The *D. lanceolata* is from one-seventh to one-third inch in length.

The mature *D. hepaticum* and *D. lanceolata* inhabit the biliary canals and ducts of the liver. The *D. americanus* occurs in the liver, commonly lying in cysts which contain one to several flukes and a quantity of dark fluid. While these cysts may originate in the biliary canal, they extend into the tissue, and this fluke is habitually found as a parasite in the liver substance, in cysts, and not as a parasite of the ducts.

The mature flukes inhabit the bile ducts of the liver. Wandering flukes of either species may be found in the lungs and elsewhere in the body.

Life Cycle of the Liver Fluke

The flukes are propagated on wet, marshy places, in slow-moving streams, canals and ditches with grass or vegetation on their banks, where it is necessary for the young flukes to pass a part of their life cycle in the body of a certain species of small water snail. While the life history of the *D. americanus* and *D. lanceolata* has not been worked out, they are supposed to be about the same as *D. hepaticum.* The life cycle of *D. hepaticum,* according to Weinland, Leuckart and Thomas, is about as follows:

If the eggs, which pass in the feces from the body of the host animal, have been properly fertilized and fall in water or where there is sufficient moisture, they may hatch. Incubation requires a temperature of 50° to 54° F., and from three to six weeks time.

* Read at the annual meeting of the Nevada Veterinary Association, Reno, January 1930.

The embryo escapes from the egg and begins moving actively about in the water, according to some investigators for one day, to others, about three hours. If it finds a suitable host, which is a small blunt, spiral snail, always with the spirals turning to the right, it penetrates into its respiratory organs and from there into the body tissues, sheds its skin and transforms into a tube-like sporocyst, with an intestinal tract. In the following two to four weeks, the sporocyst divides into five to eight rediae with digestive tract closed at one end, and from these daughter rediae are formed while the snail hibernates during the winter. In from four to six weeks more, there are formed in each rediae from fifteen to twenty oval tadpole-like cercariae, with two suckers, long rudder-like tail, and branching intestinal tract. These cercariae emerge through the oral cavity of the rediae and later leave the body of the snail.

According to the above-mentioned investigators, the infection is carried over the winter, on infected pastures, by a few eggs which did not hatch the previous autumn, and by cercariae in the bodies of hibernating snails. The pastures are also reinfected from the droppings of animals, which harbor flukes from year to year. This is indicated by the fact that the heaviest infestation of animals usually takes place from August to late autumn. According to field observations in this country, most of the infection on the pastures is carried over the winter as unhatched eggs, which, according to this theory, is something like this:

As the flukes reach maturity in the bile ducts of the liver of sheep, eggs are laid which pass out with the feces. Those that fall in dry places perish, while of those that fall in the water, a few may hatch that season, but the most of the eggs remain viable, not hatching until the water has attained a certain temperature the following spring. In most Nevada sections, this will be late April to late May, after which the embryo goes through the successive changes in the snail as before given. This last theory is strongly borne out by the fact that a heavy infestation of sheep usually takes place in about two months after the water in swamps has warmed up and, further, by the fact that between the time the water has become warm, and some two months later, many snails may be found which contain cercariae. On the other hand, after this period, while many snails may be found, few if any will contain cercariae. If the egg hatching and development of cercariae were a continuous process during the summer, it would be easier to find snails in August and September harboring cercariae than in June and July.

After leaving the body of the snail, the cercariae swim about in water, where they must shortly crawl upon grass or other water plants or objects, and encyst. Failing to attach themselves to grass or other objects, they encyst on the surface of the water.

According to investigations of Ssinitzin, the encysting takes place one and one-half centimeters or approximately one-sixteenth of an inch below water level, in an average of sixty per cent of the cercariae. In twenty-four per cent, they are located deeper, and in ten per cent, above the surface of the water, while in six per cent they encyst in a free state directly on the surface of the water.

It is only after encysting that the cer-

A band of 2,200 sheep. Photographed by E. T. Baker

cariae become infectious for sheep, and it is while encysted on grass or other vegetation that they are eaten by sheep, or where they encyst on the surface of the water and collect in quiet pools they may be swallowed by the animals while drinking. After reaching the stomach of the animal, other changes take place. The immature fluke starts migrating to the liver, where it becomes mature and the life cycle starts all over again.

It is claimed that a single mature fluke in the bile duct may produce from 30,000 to 40,000 eggs. When it is considered that the intermediate generations propagate assexually in the body of the snail and that under the most favorable conditions from 150 to 300 or more cercariae may develop from each egg, with ten million or more from each fluke, it can be readily understood why such heavy infestation of animals may occur.

It appears that the encysted cercariae cannot survive severe freezing, but that it can survive considerable drying, and may retain its vitality on hay for a considerable period. While nearly all infestations occur when sheep are on pasture, and before severe freezing, infestations can occur if hay contaminated with cercariae is fed during early winter.

After the cercariae are taken into the stomach of the animal, either with food or water, the cyst encapsulating the cercariae is dissolved and the young fluke, almost microscopic in size, escapes into the intestinal tract.

It is not known definitely just how all the young flukes reach the liver. Some, in penetrating the walls of the intestinal tract, may enter a blood vessel and be carried to the liver, while others may thus be carried to other organs or parts of the body, where they perish. Some may enter the bile duct at its orifice in the intestine and thus ascend to the liver. Ssinitzin has found, in experimental animals, that the ingested, encapsulated cercariae are carried into the intestinal tract and that the capsule is dissolved in two to three hours, liberating the cercariae or young flukes. Later, they penetrate the intestinal wall and reach the abdominal cavity, crawl about on the different organs, feed upon red blood corpuscles, which they derive from the superficial capillaries. They gradually collect upon the outer surface of the liver, attach themselves to it, and bore into it, many eventually reaching the bile ducts, where they become mature flukes. As such, they are blood suckers, sucking the blood from the walls of the bile ducts.

There is a difference of opinion among investigators relative to the maximum length of time it takes all the young flukes to reach, and penetrate, the liver after they have been taken into the digestive tract of the animal. This period of time has been estimated at from four to fourteen days by some and as many as thirteen weeks by other investigators. The last is probably nearer correct if symptoms observed in sheep are correctly interpreted.

The length of time the mature flukes remain in the liver varies. Live flukes have been found in the livers of animals five years after the last possible chance of infestation. In most cases, however, all the flukes will live not to exceed eight or nine months, then die and disappear.

Pathology

In penetrating the liver and reaching the biliary canals, the flukes destroy much liver tissue, which can be detected upon examination of the organ on autopsy. Also, this destruction of liver issue, in some sections of the country, permits secondary infection resulting in the death of the animal.

Symptoms of Fluke Infestation

Not many symptoms, if any, are observed in the beginning of ordinary liver fluke invasion of sheep. Some soreness may be detected in the region of the liver upon careful examination of sheep. Later, there may be a stimulation of the liver due to irritation, which promotes

the flow of bile and also stimulates the appetite and digestion, resulting in an apparent faster gain in weight by the affected animal. As the flukes increase in numbers and size, and take more and more blood from the walls of the ducts, this seeming gain in weight is soon lost, the sheep then loses weight, becomes anemic and may die, depending upon the number of flukes present. One of the important symptoms observable as this anemic stage approaches is a swelling under the jaw in the intermaxillary space, and on the neck. This swelling and the unthriftiness may be the only symptoms noted by the observer in uncomplicated cases. Such symptoms do not, as a rule, occur until three weeks to two months after infection, and then as a rule, only when fifty or more flukes are present. A few flukes in the liver of sheep, when uncomplicated, cause no apparent disturbance to the health of the animals.

Diagnosis

Diagnosis of liver fluke disease, in most cases, is a very simple matter. If the sheep have been grazing on wet, swampy pasture, or on canal or ditch banks, flukes may be suspected. If there is a recently dead sheep for autopsy, mature flukes may be found in the ducts of the liver.

Cases where deaths occur from some secondary infection may offer more difficulty in determining the true cause. Decomposition sets in very rapidly in sheep, and one or two very small flukes in the liver of a sheep dead only a few hours may disintegrate and not be found. Decomposition may obliterate all trace of focal infection in the liver.

Secondary Infections

In complicated cases, or more correctly speaking, infections secondary to liver fluke invasion, fatalities are rapid, and may be caused by the invasion of the liver by only one immature fluke. In Nevada, such cases are the cause of the death of almost all sheep dying as a result of invasion of the liver by flukes.

These infections secondary to liver fluke invasions deserve fuller discussion than ordinary liver fluke disease, as they are not very generally recognized or understood by the veterinary profession and the sheepmen of the West.

For many years, in different sections, in several western states, it was observed that some sheep, when grazing on wet, marshy pastures, would suddenly die. In most cases, they had not been observed to be sick, the owner saying they all appeared well when coralled in the evening, one or more being found dead the following morning. In some instances the owner would see the sheep at noon, all appearing healthy, then find one or more dead an hour or so later. These deaths were always associated with liver flukes, and for years were considered as secondary to flukes without their true cause being known.

In Australia, a similar disease of sheep is known as black disease. Dodd, of New South Wales, investigated this disease in 1921, and considered it due to an anaerobic bacillus which he isolated from areas of focal necrosis in the liver of sheep seen to die of black disease. He did not, however, specifically identify his organism. As a result of his observations upon the etiology of black disease, Dodd drew attention to the fact that in sheep dead of black disease, early fluke infestation was evident. He accordingly concluded that the fluke was a concomitant factor in black disease, in that it acted

A band of 3,000 sheep. Photographed by E. T. Baker

as a mechanical carrier of the causal organism to the liver.

Other investigators of Victoria, as well as New South Wales, had, before 1924, found that Dodd's bacillus was a variant of the *Bacillus edematiens,* and that there are certain cultural differences between the organism of the two sections. They also discovered that it could be protected against by the use of edematiens antiserum.

Dade and Huffman of Idaho made a painstaking investigation of liver fluke disease of Idaho sheep. In 1925, they published a description of this disease, which, for clearness and fullness of history, symptoms and gross pathology, has not been surpassed by any one. These investigators considered the immature migrating fluke the carrier of anaerobic infection which caused the death of the sheep.

The Veterinary Research Station of New South Wales did not accept Dodd's theory of the immature fluke being the mechanical carrier of the infection from the intestinal tract to the liver of sheep dying from black disease, so this station continued their investigations. During 1927-28, they examined the livers of apparently healthy sheep from sections of the country where black disease existed and found 7% of all such livers carried *B. edematiens,* and in some lots as high as 24% of livers carried this organism. They were unable to recover the organism from livers of sheep from sections where black disease did not exist. The conclusions in their 1927-28 report are as follows:

"All evidence so far collected has gone to show that fluke infestation is a concomitant factor in black disease. It would appear that the destruction of hepatic tissue caused by the presence of immature flukes in the hepatic parenchyma is sufficient to bring about suitable conditions for the growth of black disease bacilli in the liver substance. If, therefore, black disease bacilli be present in the liver of a sheep, and such tissue destruction takes place (following infestation by young flukes) it would seem that the two conditions necessary for development of the disease are provided, and it is only when such tissue debility is brought about that black disease bacilli are able to exert their pathogenic effect.

"One can thus readily appreciate that once the required condition for the growth of the organism is obtained, elaboration of toxin would be rapid, and in consideration of the potency of the toxin, elaborated by this organism, the rapid onset and sudden death of sheep in cases of black disease may be explained. Thus is explained the association of recent infestations by immature fluke with the development of black disease."

Treatment

After the flukes have reached the bile ducts, it is reported that 1cc of carbon tetrachlorid administered in a capsule to sheep will kill all the liver flukes present, with the exception of the very small ones. A second dose in fifteen to twenty days is recommended to kill those flukes not killed by the first dose.

There is no known treatment for the secondary disease caused by invasion of the liver by immature flukes. Once flukes are taken into the digestive tract of the sheep, drugs will not affect them until they have reached the bile ducts. Once sheep have begun to die from this cause, the rational thing to do is to immediately take them from the infected pasture.

Prevention

The exposed sheep may be protected against this secondary infection by being given an immunizing dose of some antimalignant edema serum, which is effective against the various variant forms of this bacillus. But this procedure is of doubtful value, as it cannot be depended upon to prevent all loss. The length of time sheep will continue dying after being removed from infected pastures varies. In ex-

treme cases they may die from this cause thirteen weeks after being taken off infected pasture. This is due to the extreme length of time it may take all immature flukes to migrate from the intestinal tract to the liver, penetrate its capsule, invade and destroy liver tissue and cause conditions suited for the development of pathogenic anaerobes already present in the liver, together with the elaboration of toxins, to cause death of the animal. Dade and Huffman found in Idaho that sheep continued to die from this cause for seven to nine weeks after being removed from infected pasture.

If only one immature fluke, almost microscopic in size in migrating from the intestinal tract through the liver substance may cause, and frequently does cause, a secondary infection which will kill the sheep, then prevention of fluke infestation is the only logical procedure to follow. This will be much cheaper and more satisfactory in the end than trying to protect the sheep by treatment with protective serum or vaccine each year.

Prevention may be accomplished first by keeping sheep off infected pastures. Second, by draining swampy pastures, and cleaning all vegetation from banks of slow moving streams, canals or ditches. Third, by treating swampy lands, pools and ditches with copper sulphate to kill the snails which are the necessary intermediate hosts for the development of the flukes. The Oregon Experiment Station was the first to discover that copper sulphate could be used for this purpose.

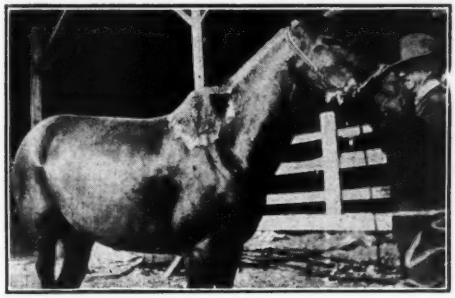
Since the summer of 1928, Robert Jay of the U. S. Bureau of Animal Industry, has been stationed at Sacramento, Cal., to develop a practical and economical method of snail destruction or liver fluke eradication.

The methods so far developed by Doctor Jay are very practical and not very expensive. The cost in labor and for copper sulphate necessary to free a pasture of snails and consequently flukes, is not as much as the cost of treating exposed sheep with some vaccine or serums used to prevent anaerobic infections.

There are but few farms or pastures in Nevada that could not be freed of snails and flukes at a very nominal expense, and all death losses of sheep from liver flukes disease avoided for several years thereafter.

FISTULAE OF THE WITHERS

Modern treatment has supplanted radical surgery to a certain degree, although both are indicated in special cases. We had four cases on one ranch caused by a peculiar condition. The owner had turned about twenty horses out to a big strawstack. They had eaten a tunnel in



the straw; rain and snow fell and froze the straw, and when the animals threw their heads or necks around at each other, the withers were bruised by the frozen straw above. However, in the writer's practice, these cases are far less frequent than some years' ago.—B.

Heifers can be given milk from, and permitted to mingle with, cows affected with abortion disease without danger provided they are removed from sources of infection before they become sexually mature. On this principal herds free of abortion disease may be developed, such a procedure entails expense that may or may not be justified.

Reviews and Abstracts

Scientific Feeding of Animals[1]

In spite of the progress which has been achieved during the last century, the practice of the feeding of domesticated animals is susceptible of many improvements which arise out of scientific progress.

In the present state of our knowledge it seems that only the laboratory, by its methods of biological analysis, can add new knowledge to the practice of feeding.

To the doctrine of thermo-dynamic equivalents and of nitro-genous minimum should now be added new ideas of which the most important are concerned with

1. The quality of the nitrogenous minimum (acid amines).
2. The minima of the chemical substances other than the proteins.
3. The needs of the organism in mineral substances.
4. The quantitatively unmeasured food (vitamins).
5. Alimentary equilibrium.

These ideas, after study at experimental institutes, should be gradually applied to practice. In order that these ideas may be placed readily within reach of the practitioner, the details actually given in tables of feeding should be increased, particularly as regards the acid amines, the vitamins, and the essential mineral elements. The conditions for which the facts proposed in the tables will be available should be laid down in as accurate a manner as possible. It would be very desirable that the methods of calculation of the value of food-stuffs should be standardized, and the same unit uniformly accepted. Rational feeding on a scientific basis is one of the essential factors for the health of domesticated animals, and for obtaining a high economic return from them. The Veterinary Surgeon in his dual capacity of doctor and zootechnician must not remain indifferent to the progress which can be achieved.

[1] L'alimentation Scientifique des Animaux; by le Dr. P. Dechambre; Professor à l'Ecole Nationale vétérinaire d'Alfort (Seine) France; and Etienne Letard; Professor à l'Ecole Nationale vétérinaire de Lyon, France. Presented at the Eleventh International Veterinary Congress, London, 1930.

The Relationship of the Veterinarian to Animal Husbandry[2]

The real meaning and value of veterinary science and animal husbandry have not been appreciated in Great Britain.

Our neglect to appreciate the magnitude and importance of animal husbandry has caused us to drift into the position of having to import more than 50 per cent of the essential food products derived from animals that we need for our own consumption, e.g., three years ago we imported for our own consumption—

54% of our beef and veal
59% of our mutton and lamb
65% of our meat derived from the pig
82% of our butter
68% of our cheese
54% of our milk and milk produce.

Our total meat supplies produced at home in 1918 were 59 per cent. In twelve years this figure fell to 48 per cent and it is still falling. In 1927 we imported nearly 16 million pounds' worth of eggs and in 1928 nearly 18 million pounds' worth. France, in this latter year, more than trebled her business with us in this commodity.

Our position with regard to these imports would be serious enough if the conditions in other countries remained stationary, but such is not the case. Indeed as regards meat, the U. S. A., instead of being an exporter, has now become a competitor with us for the meat of the Argentine and New Zealand. An economic situation has thus arisen which demands from us a greatly increased home production of the commodities provided by the domestic live stock. It is an urgent national need that these be produced in sufficient quantity and quality and purchasable at prices within the means of the people.

[2] The Relationship of the Veterinary Surgeon to Animal Husbandry; by Professor J. Share-Jones, D.V.Sc., M.Sc., F.R.C.V.S.; Director of Veterinary Studies in the University of Liverpool, England. Presented at the Eleventh International Veterinary Congress, London, 1930.

There has been a concurrent neglect to attach a real value to veterinary science in Britain and this is reflected in the annual output of qualified veterinary surgeons. The following figures taken a few years ago show the annual output of qualified veterinary surgeons in proportion to the population in several important countries:

U. S. A.	1 in	120,000
Denmark	1 in	133,000
Germany	1 in	210,000
France	1 in	300,000
Sweden	1 in	275,000
but provision was made for	1 in	183,000
United Kingdom	1 in	500,000
out of this number the Crown Colonies, India and the Army take a large number and the ratio ignoring these would be almost	1 in	800,000

The science would appear to be in danger of ceasing to exist as a separate entity in this country unless the present narrow interpretation of its service to the nation be corrected. Veterinary science does not, or is not allowed to, play the part for which it is designed, and this is due largely to the inadequacy of the law as it stands today. So far as modern veterinary science is concerned the bulk of its governing legislation is based upon old Acts of Parliament which in the light of present day knowledge and requirements have long become obsolete. The time is ripe to scrap all the existing acts and orders relating to domestic animals and to secure in their place one consolidated act dealing with the animals, their products and by-products.

The progress made in veterinary science in this country has far outstripped the measure of development of the public appreciation of its value. What is required now is not so much research as a vigorous and intensive application of existing knowledge.

The history of Denmark during the latter part of the last century demonstrates clearly what an increased home production of animal products can do to bring about national prosperity. Similar revolutionary methods must be applied to agriculture in Britain, and when the proper relationship of the veterinary surgeon to animal husbandry has been appreciated there will be presented to veterinary science the opportunity of assisting in the solution of what is probably the greatest problem of the day—the people's food.

The Veterinarian and Animal Husbandry[3]

The modern status of agriculture in the world, the great spread of biological science in the last decade, and the results of observations made directly from life demand that animal husbandry which takes a prominent place in the organization of agriculture in western and central Europe, should be placed on a wider basis, that is to say, a more rational basis than it has been hitherto. For a long time ainmal husbandry was looked upon almost exclusively as the sphere of the agriculturists who received their education at the higher or middle agricultural schools. The curricula of these schools include only lectures on plant cultivation and subjects of agricultural science, such as physics, chemistry, minerology, geology, zoology and botany, viewed more particularly from the agricultural standpoint. Modern animal husbandry, however, demands in addition to a knowledge of physics and chemistry concerning the physico-chemical processes of the animal body, knowledge of the science of morphology (embryology, histology, descriptive, comparative, and topographical anatomy), zoology and to a much higher standard normal and pathological physiology, as they are contained in the curricula of the Veterinary High Schools.

Sterility in mares which occurs with increasing frequency, abortion in cows, sterility in sheep, are indications of a condition of disease in the animal body with which the veterinary surgeon alone can deal if the destruction of the breeding industry is to be avoided. On the other

[3] Beziehungen des Tierarztes zur Tierzucht; by Professor Dr. Siegismund Markowski; Rektor der Tierärztlichen Akademie, Lwów Lemberg, Poland. Presented at the Eleventh International Veterinary Congress, London, 1930.

hand the agriculturist must concern himself with the breeding of animals, that is to say, with the practical part of animal breeding and to provide crops which will ensure quantitative and qualitative nourishment for the animals. Thus animal husbandry rests upon two fundamental principles, Hygiene in the widest sense of the term and Economics, without which there can be no question of a rational animal husbandry. The first lies in the hands of the veterinary surgeon and the second in those of the agriculturist.

The following resolutions are recommended for adoption:

1. For the purpose of a rational development of animal husbandry there should be included in the curricula of the Veterinary High Schools, teaching on animal husbandry in its widest sense, including the small animals such as birds, fish, crabs, bees and silkworms, both theoretical and practically, but in the case of the latter in broad outline.

2. For the purpose of thorough specialization in both theoretical and practical animal husbandry a commission appointed by the 11th International Congress might consider whether it would be advantageous to create special faculties of animal husbandry within the Veterinary High Schools or special Zootechnical High Schools.

Triplets delivered by Dr. O. W. Biersdorf, Milford, Mass. This cow produced one calf at her first calving, Twins at her second and Triplets at the third calving.

Observations on Heredity and Its Relation to Animal Husbandry[4]

As a result of the rediscovery of the Mendelian laws the investigation of heredity made a rapid advance at the beginning of the 20th century, which was greatly facilitated by cytology. The basic knowledge regarding the processes of heredity in plants derived from cultivation experiments were soon applied with advantage to plant cultivation in practice.

In the breeding of animals both the investigation and the practical application of experimental results encountered great and to some extent insurmountable difficulties.

As examples of these may be mentioned the impossibility of self-fertilization in the higher animals, so that individuality cannot be tested directly by its hereditary organization; low fertility, which prevents large numbers being obtained, and thus makes ready recognition of the laws impossible; further, the great variation of the characters which cannot always be accurately determined and exactly defined. But above all, in the case of the higher animals elementary difficulties for both science and practice are due to the complexity of the genetic structure of the morphological and physiological characters which interest us. Their development does not depend simply upon the interplay of hereditary factors, but, over and above this, upon the special part played by the endocrine system in the organism.

A large number of the characters of our domesticated animals have been studied with regard to their hereditary nature in the sense of modern genetics and with varying results. Some of these, such as the color of the hair, the quality of the hair, the form of the skin appendages, etc., permit of recognition of their hereditary nature, which agrees fairly

[4] Betrachtungen über angewandte Vererbungslehre mit Rücksicht auf die landwirtschaftliche Tierzucht; by Prof. Dr. Karl Keller; Vorstand der Lehrkanzel für Tierzucht und Geburtshilfe der Tierärztlichen Hochschule, Vienna, Austria. Presented at the Eleventh International Veterinary Congress, London, 1934

closely with the simple laws of division, and can be explained on the grounds of factors without any involved assumptions. Many other factors, however, and particularly quantitative differences in body development, physiological characters, which are of extreme economic importance, are liable to irregular hereditary transmission. Varying degrees of intermediate heredity are observed. As a matter of fact, it is probable that there is a cleavage heredity in these cases also, but owing to the genetic complexity of the characters in question it is recognizable with difficulty only. Recent investigations in connection with milk production show this in a striking manner. Working hypotheses, such as polymery and homomery, are useful for making various complex evidences of heredity more intelligible, but they do not explain the actual processes. In this connection progress is desirable.

Modern genetics is in a position at the moment to supply comparatively few definite data for special cases in practical breeding, but it does furnish some general principles of importance, some of which are directly opposed to current views, while others confirm the correctness of methods that are in operation.

The following are the most important of the conclusions that can be drawn:—

1. The breeding value of an animal can be discovered only by actual use; its pedigree allows conclusions only, which are in the nature of probabilities, to be drawn.

2. Over-feeding and over-management render selection for breeding difficult.

3. Animals for breeding on an economic basis should be selected on the grounds of capacity and soundness alone. If subsidiary characteristics are taken into account rapid progress is hindered.

4. In-breeding hastens very considerably the achievement of results. In healthy families it causes no harm. In families with hereditary defect it leads to rapid recognition of the condition.

5. Crossing can serve a very useful purpose in the production of utility animals on account, on the one hand, of dominance of valuable characters, and on the other of luxuriant health.

6. Families which have shown themselves to be burdened with "lethal-factors" should be excluded from the breeding of utility farm animals. Not only must the animals having the character be eliminated, but their predecessors also.

7. In order to furnish a satisfactory basis for modern breeding investigation, fully equipped institutes for investigation and breeding establishments are essential. The results of investigation should be put into practice at the latter for the production of primary breeding strains to be used in the country.

8. Sterility and the diseases associated with breeding should be dealt with not only by treatment but by selective breeding.

Genetics Applied to Animal Husbandry[5]

For the following reasons Mendelian laws cannot be applied on a large scale in the field of zootechny, and the views regarding heredity held by the Neo-Mendelians cannot be accepted without reserve.

1. Practically, all the races of domesticated animals are of hybrid origin.

Purity of race, prior to making crosses, could probably be determined, provided it concerned only simple morphological characters in small, very prolific animals. But almost insurmountable difficulties are encountered in the case of large animals of limited fecundity when quantitative physiological characters are concerned (production of milk, meat, etc.).

2. Auto-fecundation of the products F1, F2 . . . is replaced in domesticated animals by amphimixing. Hence the difficulty of recognizing the individuals DD and DR which present the same phenotype. Theoretically, one could overcome

[5] Sur la Génétique appliquée à la Production des Animaux; by le Doct. Prof. Antoine Pirocchi; Directeur de la Station expérimentale de Zootechnie annexée à l'Institut royal supérieur agricole de Milan, Italy. Presented at the Eleventh International Veterinary Congress, London, 1930.

this difficulty by analyzing the genetics of descent. But for certain reasons which hinder the determination of the purity of race, this is not a simple matter in the case of large animals.

3. One of the greatest obstacles is the small number of progeny produced by the domesticated animals annually. When only small numbers of animals are available for study, the Mendelian numerical ratios are rarely encountered, and it may even happen that all the progeny have the dominant character, or—although very rarely—the recessive.

4. Large numbers of animals must be available to provide individuals presenting constant combinations of various characters. Research has shown that the ratio of pure animals to the total number under experiment is 1:16 for the combination of two characters, 1:64 for 3 characters, 1:256 for 4 characters, 1,048,576 for 10 characters, and 1:1 trillion for 20 characters.

5. The length of the biological cycle of the domesticated animals increases the difficulties. It would require sometimes more than a century to determine the purity of animals for crossing and to analyze the genetic descent of uniparous animals of limited fecundity with a long period of gestation.

6. The definition and identification of characters, and particularly those which are of zoo-economic interest (weight, milk production, etc.), is a matter of difficulty. Since they are complex and always correlated to other characters, their independence cannot always be proved.

7. The factorial conception has increased the difficulty of applying the Mendelian theory to animals. "Character" and "factor" are mere words, not explanations. We are far from having reached a plausible interpretation of things by supposing the existence of factors and . . . factors modifying other factors.

8. The Neo-Mendelians localize the hereditary characters in the chromosomes. As the cytoplasmic heredity of Correns and the presence of group-specific substances in the red corpuscles of man, in the majority of fixed tissue cells, and in the spermatozoa proves, the cytoplasm must also be taken into account. Further, the conditions under which development takes place must also be considered, as has been proved by the study of the sexuality of bactracians.

9. Their etiology does not explain mutations which appear suddenly and promptly become hereditary. Their appearance makes the application of the Mendelian theory extremely difficult.

10. The functional exercise of the various organs, to which animals have to be subjected in order that they may be utilized to the utmost, forms another obstacle to the exact interpretation of experiments in genetics—that is to say, it is impossible to distinguish between the parts played by functional development and heredity in the results produced.

While recognizing that, thanks to the investigations of the Mendelians and Neo-Mendelians many problems of the physiology of descent appear to be less obscure than formerly, much research must be carried out in the vast field of biology before it is possible to arrive at data which are of practical significance.

The Standardization of Biological Products[6]

The remarkable progress which has been made in the control of infectious diseases with the aid of biological products and the extensive use of the preparations necessitate certain definite standards for the evaluation of their potency and purity. The standardization of a few of these products, such as tetanus antitoxin, has reached a high state of development. When we consider that the control of tuberculosis in some countries is dependent on the tuberculin reaction, that the control of hog-cholera is dependent on the effectiveness of the simultaneous

[6] The Standardization of Biological Products; by A. Eichhorn; Director, Veterinary Department, Lederle Laboratories, New York, U. S. A. Presented at the Eleventh International Veterinary Congress, London, 1930.

vaccination, and that one method of controlling infectious abortion is dependent on the aid of the agglutination test, it is apparent that tuberculin, hog-cholera serum and virus, and the agglutination test and its antigen should be carefully standardized, and that this procedure has not kept pace with the extensive use of the biologics, the agglutination test, and the diagnostic reagents. There are many other diseases for which biologics are being prepared and used and for which standards should be formulated.

Efforts have been made to establish definite standards for the various products; but we have no uniformity of requirements for such standards in the different countries, nor do we have any dependable procedure upon which these standards can be established.

Many of the Governments control the manufacture of biological products in a regulatory manner and require standards that are known to establish their potency and purity with some degree of accuracy.

The production of veterinary biological products in the United States is under the control of the Bureau of Animal Industry, Department of Agriculture. Official testing is conducted on the products in certain other countries. Such official testing, however, is limited to certain preparations and no testing or supervision is exercised over other products. Thus there is no uniformity in Governmental supervision of biologics in the different countries; neither is there a uniform requirement for standard methods in their preparation.

The number of products for which we possess definite methods of standardization are very few, and for the great majority of biological products we have no accurate way of determining the immune body content or antigenic properties, and are more or less dependent on the statements of the manufacturers for their potency value. In this latter class, not only do we have to include many of the antibacterial sera, but especially the bacterial vaccines consisting of killed organisms.

For potency testing of many of the anti-bacterial sera, we are now depending on their agglutination titre or degree of complement fixation, which, of course, we cannot accept as an indication of the potency value of these products because we have to acknowledge that the presence of agglutinins or complement-fixing bodies is by no means an indication of the antibody contents.

The products prepared from bacteria killed by either chemical or physical means also represent a class for which we have no dependable means of evaluating their potency. Probably the most accurate means which has been developed for this purpose is the actual count in the hemocytometer of the number of organisms.

A considerable amount of work has also been carried out with the opacity test, either with the use of the nephelometer or by comparison with a standard solution of definite turbidity. The actual determination of the nitrogen contents of bacterial suspensions probably offers the most accurate means of standardization; but here again we have to consider the laboriousness of the method.

In the standardization of some of the bacterial vaccines, test animals are injected with an accepted standard vaccine for the purpose of producing agglutinins; at the same time the product to be tested is injected into other test animals, and the comparison of the agglutination titre is used as the index of potency. This procedure has been found satisfactory in testing typhoid and other anti-enteric vaccines.

All these procedures at the best, however, have only relative value in the determination of a definite standard, and cannot offer any definite guide in determining the immunizing value of any of these products.

The development of more accurate standards for the products containing living organisms offers better possibilities. On the other hand, we are confronted again with the necessity for more accur-

ate standards because no definite tests are known by which an accurate evaluation can be established. In this class of products, at the present time we have to depend more or less on a relative standard as determined by the protection tests of animals inoculated, as, for instance, in hog-cholera virus, anthrax vaccines, and swine erysipelas cultures, etc. In all diseases where the use of attenuated or active live products can be used for the control of the disease, the results are more certain and the possibility of standardization offers better prospects.

Another important phase in the employment of biological products is the determination of the time limit of their activity and viability. It is very essential that proper control be exercised so that the limitation for their use should not be extended over a known period wherein they will retain their potency.

The standardization of most of the anti-bacterial sera offers considerable difficulties because we have to depend either on the protective tests in animals or on biological tests for the determination of their contents in agglutinins, precipitins or complement-fixing bodies. With the antitoxic sera, the problem may be considered as practically solved, as there always is the possibility of utilizing the neutralization test of a standard toxin against the antitoxin.

The use of chemically-treated toxins is increasing. In the control of many diseases it has been found that modified toxins may be safely employed for the active immunization of man and animals. In this group, we have toxoids or anatoxins as well as the filtrable viruses which are killed or attenuated either by chemical or physical means.

Diagnostic agents are of the utmost importance in the control of some diseases. The attempts to eradicate certain diseases with the aid of such preparations and the possibilities which these products offer towards success along this line make their standardization very important. The striking results of controlling glanders with the aid of the mallein test, and bovine tuberculosis with the tuberculin test, are examples of the great possibilities of their utilization. The tremendous progress made in the control of tuberculosis in the United States, with evidence of ultimate eradication, points to the importance of the uniform potency of these agents.

While tuberculin and mallein, no doubt, are the outstanding examples of these products, we may hope that others may be developed which might prove to be equally dependable weapons in the hands of the live stock sanitarians for the control of infectious disease in animals. It is for this reason that products of known potency should be of a recognized standard and that all efforts should be directed towards developing means by which uniform standardization can be accomplished.

Among the diagnostic agents, we may also classify those antigens which are now used extensively for diagnostic purposes, and therefore should be standardized in order that uniform results may be depended upon in all cases where the method is being employed. Reference is especially made to the antigens used in the agglutination tests for pullorum disease in chickens and abortion disease in cattle, and in some cases antigens used for the complement-fixation test for diagnosing diseases in animals. The discrepancies which occur in the active work with these antigens are sufficient proof of the necessity of a dependably uniform standard for such antigens.

While it is recognized that in these tests the personal element is likewise a factor in the variability of the test, it may be expected that with a definitely standardized antigen the tests could be carried out with greater reliability.

Aside from the potency of the products, it is natural that safety and purity of the products must also be given consideration. The biological products should be free of living organisms excepting those, of course, where such live organisms are

intended for immunization purposes, and, therefore, the sterility testing should constitute an important phase in the production of the products. This test should not only be confined to the testing of the final containers, but also of the bulk before the final fillings are made.

There should also be a uniform procedure for sterility testing. At the present time various methods are being emp'oyed. The plating of the product to be tested is practiced in many of the countries; whereas, in the United States the sterility testing is conducted with the view of combining aerobic and anaerobic tests in one container. For this purpose two-armed fermentation tubes are used, and inoculated tubes are examined for 7 days for any possible contaminations. This procedure has been found very satisfactory, and could well be adopted for a standard procedure for sterility testing of biological products.

No effort is made in this report to give definite standard methods for the biological products, primarily because it is recognized that at the present time the reactions between infection and immunity are still obscure and are not clearly understood, and, therefore, until our knowledge is based on more established facts, these standards will remain more or less uncertain. Aside from the very few products for which we have known definite standards, there is urgent need for further investigations to develop accurate means for uniform evaluations of biological products.

The methods now in use vary to a great extent because we have no established accurate standard by which it is possible to proceed for uniform results. Further progress will have to be made to enable us to proceed along more definite and dependable lines, and the urgency for such activity becomes apparent when it is considered that the success of controlling many of the diseases now is to a great extent dependent upon the use of biological products. The importance of biological products cannot be over-estimated. The utilized forces behind evolution in our conflict with infections through the employment of dead or living pathogenic products in our warfare against it, is perhaps the culminating triumph in modern medicine. In employing these means, however, we must always keep in mind that we must be in possession of definite standards to make the best use of this means of disease control.

In this discussion it has not been the aim to point to definite procedure or even to suggest definite outlines for the standardization of the different products now employed. We have to recognize that with the present methods, aside from only a very limited number of products in which accurate standardization is possible, we are confronted with chaotic conditions, and therefore it is the intention to limit this paper to recommendations whereby it might be possible to proceed along definite lines of action.

The uniform standardization of biological products would have a tendency to assist in safer international traffic in live stock and often eliminate the danger which exists at the present time from this source. Another important point which is of international importance is the element of danger existing in diseases of animals communicable to man, and which might be introduced if proper measures are not taken to eliminate such possibilities.

The means by which dependable, uniform standardization of biological products may be accomplished offer a difficult task, and while we cannot even hope to accomplish a project of this magnitude within a short time, an effort might be made in this direction.

Through the creation of an International Committee for the standardization of biological products a definite program may be followed. The Committee could utilize the various Government laboratories for the study of the various phases of this work. The result of such laboratory work could then be compiled by the Committee, and if the methods

recommended meet with their approval, it could be adopted for international usage. The Committee might also establish means for the supervision and distribution of cultures and toxins, diagnostic sera, etc., used in the preparation and standardization of the products which we must consider as an initial step towards unification of the work. It is only by standard procedures that we can hope to obtain preparations of more or less uniform activity.

A German View of Hog Cholera[7]

1. The diagnosis of hog cholera is based in the first place upon the clinical symptoms and on the lesions. In doubtful cases resort is to be had to experimental transmission to healthy pigs.

2. In many cases, only a probable diagnosis can be based upon the symptoms. Therefore, the epidemiology of the disease must be thoroughly investigated.

3. In acute hog cholera the lesions are those of an acute hemorrhagic septicemia.

4. In chronic cases diagnosis is often more difficult, particularly if the characteristic lesions are not present.

5. Lesions may occur in the lungs only or there may be intestinal lesions also. In many cases they are to be ascribed to hog cholera.

6. There may be a complete absence of recognizable lesions in animals that have wasted as the result of hog cholera.

7. Experimental transmission to healthy pigs is of valuable assistance in the diagnosis of hog cholera. It is, however, expensive and consumes a lot of time. In cases where the experimental animals remain apparently healthy, it is necessary to determine whether any immunity has been established.

8. The bacteria found in cases of hog cholera are of only secondary importance. They cannot by themselves produce any disease of an epizootic nature. Many cases of so-called chronic swine plague are really cases of chronic hog cholera.

9. Effective control of hog cholera is to be achieved by the use of an immune serum of high titre.

10. The testing of serum by the State in Germany serves the purpose of evaluating the immune serum very well.

11. In practice hog cholera can be controlled by the use of serum and also by the method of simultaneous inoculation.

12. The use of serum alone is successful on infected premises only if it is applied promptly and strict attention is paid to hygienic principles. Its disadvantages are the brief duration of the passive immunity which it confers and the uncertainty as to whether the animals inoculated have acquired active immunity.

13. For this reason it has been the practice in Germany for several years to employ simultaneous inoculation on infected premises *using the virus actually occurring on the premises.*

14. Simultaneous inoculation, when properly applied, transmits the disease rapidly and systematically to all the animals with very small losses, and produces a lasting immunity.

15. It also renders possible the curative inoculation of pigs in the febrile stage of the disease, which, with simple serum inoculation, would have to be killed.

16. By means of the serum simultaneous inoculation on an average 95% of healthy animals can be saved.

17. By the use of double doses of serum, from 50 to 75% of pigs in the febrile stage of the disease can be saved.

18. There is only a slight risk of producing "wasters" and "carriers" by means of the serum simultaneous inoculation.

19. The simultaneous method of inoculation can be used with advantage on premises that are chronically infected for the adult animals. It is essential that a virus of sufficient virulence be used.

20. Inoculation supplies effective support to veterinary police regulations.

[7] Schweinepest (Diagnose und Impfung); by Dr. med. vet. Wilhelm Geiger; Leiter des Instituts zur Bekämpfung der Virusschweinepest der I. G. Farbenindustrie A.-G., Eystrup a.d. Weser, Germany. Presented at the Eleventh International Veterinary Congress, London, 1930.

Hog Cholera (Diagnosis and Inoculation)[8]

As in the case of all other plagues, prompt and definite diagnosis is the basis of control of hog cholera. Diagnosis presents no difficulties during the acute stages of the disease. It is exceptional, however, for a diagnosis to be arrived at by clinical examination alone, but the nature of the disease quickly becomes apparent on examination of an animal that has died, or has been killed, when seriously affected. It is a recognized character of the virus of hog cholera that it damages the parenchyme and the small blood vessels and thus causes hemorrhages in all the organs. These hemorrhages vary in extent from the smallest specks to extensive extravasations. Hemorrhages of this type occur in no disease of the pig other than hog cholera. The demonstration of these hemorrhages, coupled with the nature of the disease, leaves no room for doubt as to its nature.

Epizootics of hog cholera resemble waves. The chronic form follows acute outbreaks, and it reappears on the premises, attacking more particularly the young pigs. This form of the disease is characterized by its benign course. Chronic hog cholera closely resembles several of the diseases commonly known as "breeding diseases," and it cannot be distinguished with certainty from these either clinically nor anatomically. A high mortality in the third to the fifth weeks of life, and the detection of hemorrhages raises the suspicion of hog cholera, and this is confirmed by a transmission experiment with susceptible pigs. There are possibilities of error even with such an experiment, but it is at the moment the only means of proving the existence of hog cholera.

With regard to inoculation against hog cholera, the injection of serum has thoroughly established its value. In the opinion of the majority of investigators, it is the only means of preventing losses on pig farms. The greatest drawback to serum inoculation is that it does not produce a lasting protection. All experience shows that for this simultaneous inoculation must be used. When skilfully carried out, the inoculation is associated with relatively small losses, and it possesses the advantage of conferring a lasting protection. Unfortunately it is not of the same value for sucking pigs, as young animals are not suitable for active immunization. As infected pig farms form the principal centers for the spread of hog cholera, it is pressing that they should be freed from the disease. That is the main problem of the moment in the control of hog cholera.

[8] Schweinepest (Diagnose und Impfung); by Dr. Wilhelm Nusshag; Berlin-Frohnau, Germany. Presented at the Eleventh International Veterinary Congress, London, 1930.

Plurality of Viruses—Immunization—Disinfection[9]

1. *Plurality of Viruses.*

In the Republic of Argentine and Uruguay, I have been able to isolate two types of foot-and-mouth disease viruses which are absolutely distinct as regards their immunizing properties, thus confirming once more the existence of several types of the virus. It is possible that future investigations may discover still other types. However that may be, one must always take into consideration the plurality of the viruses in methods of active and passive immunization if one wishes these methods to be efficacious.

2. *Disinfection.*

The virus of foot-and-mouth disease dried under favorable conditions, as is frequently the case naturally, is capable of retaining its vitality and virulence for some months. Many centers of foot-and-mouth disease reappear spontaneously each year, due to this conservation of the virus in the dry state. It has therefore been wrong to blame meat from the Argentine as the determining cause of outbreaks of foot-and-mouth disease

[9] Fièvre aphteuse. Pluralité des Virus—Immunisation—Désinfection; by le Professeur J. Lignières; Délégué du Gouvernement Argentin, Buenos Aires, Argentine Republic. Presented at the Eleventh International Veterinary Congress, London, 1930.

which occur from time to time in England. We know now that the principal cause of these outbreaks is the prolonged conservation of dried virus in old centers.

These facts enforce recognition of the necessity for rigid disinfection of places, transport vehicles, and, generally speaking, everything which may have become infected by animals suffering from the disease.

The best disinfectant, on the grounds of efficacy, rapidity of action, cheapness, and absence of injurious action, is sodium hydrate. This should be used in 1% solution for animals and 2% for inanimate objects, places, vehicles, etc.

3. *Immunization.*

Foot-and-mouth disease produces a strong immunity against the type of virus responsible for it.

The immunity gradually disappears, but it usually persists for about a year. Early relapses are encountered, but these are explained by the fact that the types of virus do not vaccinate against each other.

It would appear, however, that repeated infections at short intervals are capable of causing relapses.

Serum therapy with polyvalent serum can render important service in the struggle against foot-and-mouth disease.

Vaccination is the most valuable because it produces a more durable immunity; this should also be polyvalent. Appropriate sanitary measures should protect animals against repeatedly renewed infection.

Systematic research has enabled me to devise a new method of vaccination against foot-and-mouth disease, and I make the request that an International Commission composed of specialists and clinicians be appointed whose duty it shall be to draw up a program of tests to which the new vaccine shall be submitted. The Commission should also suggest means whereby the program shall be put into operation as speedily as possible. If the International Commission confirms the efficacy of the vaccine, as I will publish the method of preparation so that it may be used universally.

Foot-and-Mouth Disease[10]

The investigation of foot-and-mouth disease has been greatly extended during the last ten years: practically all civilized countries in which animal-breeding has reached a high pitch of development have taken part in it. The work has been simplified by the discovery that guinea-pigs can be utilized as experimental animals. Biological problems have also been the subject of investigation. It has not yet been found possible to render the virus visible, but filtration and ultra-filtration experiments show that the size of the virus is about 3 microns. Success has been achieved in cultivating the virus in tissue cultures. Multiplication took place through 12 passages during 46 days 6.8 times 10^{20}. Plurality is the key to much of our knowledge regarding the epizootiology of the disease. There are three distinct strains which do not immunise against one another: a susceptible animal can be infected with the three strains in succession within a brief period. In addition to the pure strains, there are variants which are co-related to the type they most closely resemble. On the Island of Riems 176 strains from practically all European countries and from the Argentine have been differentiated. As far as Germany is concerned, it has been established that the spread of the disease is proportional to the number of strains and variants found.

As yet, we have not certain knowledge regarding the appearance and disappearance of new types of virus. But it is known that within a strain differences can be discovered, which come to light in the course of outbreaks; for example, predilection for one species (pig) and absence of infectivity for another species or for experimental animals.

Disinfection. The diseased animal and

[10] Ueber Maul und Klauenseuche; by Professor Dr. med. vet. et. med. h.c. Otto Waldmann; Direktor der Staatlichen Forschungsanstalten, Insel Riems, Germany. Presented at the Eleventh International Veterinary Congress, London, 1930.

its stall are a serious source of danger in the spread of the disease. As a rule, an infected animal excretes the virus for ten days after it has become ill, in the milk, urine, feces, and saliva. It persists longest in the saliva. The vitality of the virus after excretion depends upon (1) the substrata in which it is excreted; (2) the medium in which the virus is subsequently deposited. Temperatures below 10° conserve it, but those above 30° are harmful. Moist heat above 50° C. kills it rapidly. The virus is very susceptible to putrefaction and sunlight (ultra-violet rays). Artificial drying of the vesicular contents prolongs the life of the virus. Epithelium from the vesicles is far more resistant than vesicular fluid against all external influences. The most certain method of disinfection is the application of moist heat. As a chemical disinfectant, Minett recommends formalin, and the American Foot and Mouth Disease Commission, soda lye; the latter is also recommended by us. A 1% solution is effective, and it may be used for spraying animals.

Inoculation. In spite of a very large number of experiments, the problem of active immunization has not yet been solved. The formol-vaccine of Vallée and Carré has not given satisfactory results in our hands. Although we are still far from achieving active immunization, there is at the present time more ground for hope.

Passive immunization by means of immune serum has been thoroughly tested. The natural amount in reconvalescent blood can be increased by hyperimmunization. Immune serum must be polyvalent. The potency is tested by means of guinea-pigs. The protection conferred by hyperimmune serum lasts for ten days. This method is suitable only for animals which are exposed to infection for brief periods, such as shows, auctions, markets, and while on journeys. Rigid application of the veterinary police regulations for the supervision of sales and markets cannot be dispensed with. If good results are to be obtained, protective inoculation must be carried out methodically in accordance with the sanitary regulations. At the present time, "ring" inoculations are being carried out on a large scale in Germany for the prevention of the spread of the disease. Protective inoculation in the form of simultaneous inoculation of healthy animals on infected premises is also being put into practice extensively. In severe outbreaks the mortality is reduced by this means from 10% to 1%. The inoculation of young animals is characterized by the production of slight infections.

On the whole, serum inoculation as an integral part of the veterinary police regulations has proved itself to be a valuable aid against the disease.

Vaccination Against Tuberculosis[11]

1. It is a mistake to think that active vaccination against tuberculosis is sufficient of itself to ensure protection against the disease. Investigation has clearly shown that the pathogenesis of tuberculosis is such as to make it essential to impose initial sanitary precautions both in bovines and in the human subject.

In view of the fact that it is only the presence of living tubercle bacilli in the body which produces the resistance, and that it is the first organism to gain access which leaves its mark, it is essential that that first invader is a harmless but efficacious bacillus of the B.C.G. type.

The prevention of tuberculosis in bovines, therefore, comprises in the first place rigid isolation immediately after birth and feeding with milk free from bacilli, and in the second place, proper vaccination with B.C.G., which results in the production of specific resistance against natural infection.

2. The absence of phagocytic action makes the tubercle bacillus a veritable foreign body which the animal body can eliminate by its natural excretory functions only.

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[11] La Vaccination contre la Tuberculose; by le Dr. Guerin; Vétérinaire Chef de Service à l'Institut Pasteur, Paris, France. Presented at the Eleventh International Veterinary Congress, London, 1930.

In an animal in an allergic state resulting from vaccination with B.C.G., and subjected to superinfections with tuberculosis, there should be, at the most, a balance between the number of infecting bacilli and the number which the body is capable of eliminating normally. If the number of bacilli absorbed is larger there will be an accumulation of virulent organisms in the lymphatic system, and actual tuberculous lesions may be produced, but these will not be extensive as a rule.

3. The Veterinary Committee on B.C.G., which was instituted by the League of Nations in October, 1928, drew up protocols of attempts to vaccinate bovines against tuberculosis, and decided that these attempts ought to be carried out on infected farms, that vaccinated and control animals should continue to live the ordinary routine farm life and should not be subjected to any artificial contagion (Ascoli, Berger, Frenkel, Gerlach, Nowak, Vallée, and Zeller).

4. Vaccination with B.C.G. is more simple than intravenous injection; the dose is injected subcutaneously, and only one intervention is required.

5. In opposition to the opinion of fifty investigators who, as a result of experiments carried out on rodents, have formed the opinion that the strain is innocuous, a few investigators maintain that B.C.G. is capable of producing progressive tuberculous lesions which are reinoculable (Nobel, Petroff, Watson). The experiments of these authors do not resist objective criticism as regards the harmlessness of the vaccine for laboratory animals.

It is not denied that it is harmless for bovines, and this is in agreement with the conclusions drawn by the Committee of Experts: "From the experimental facts collected, and from the unanimous opinion of practitioners who have used B.C.G. for bovines, it is clear that vaccination by the method of Calmette and Guérin is absolutely harmless for bovines."

6. The reports published during the last three years by laboratory workers and practitioners can be grouped according to whether the initial hygienic measures, which are indispensable, were observed or not, and also by the manner in which the infection tests were carried out (whether deliberate infection or natural contagion).

Ignorance of protective measures for small animals and unreasonable methods of testing lead to the production of bad results. The more closely investigators adhere to the conditions which we know to be essential the more favorable to the efficacy of the vaccine the results become.

The regulations laid down by the B.C.G. Commission about two years ago for free treatment of bovine tuberculosis adapted to the immediate interests of stock-owners and carried out under the control of the veterinary service, serve as a guide to those veterinary surgeons who really desire to do useful work in combating tuberculosis. They are as follows:—

(*a*) This method of protection can be applied on all farms infected with tuberculosis where it is the custom to raise young animals to replace the old ones.

(*b*) These farms must be provided with a small isolation stable, carefully disinfected and kept in proper condition constantly, in which calves are to be put immediately after birth and prior to dressing the navel.

(*c*) These calves are fed artificially from a bottle only, or on germ-free milk from a pail. The giving of the colostrum is forbidden.

(*d*) Calves, at least heifer calves, which are intended for breeding, are vaccinated subcutaneously with B.C.G. within a fortnight of birth.

(*e*) Vaccination is repeated annually.

(*f*) Since the beneficial action of the inoculation may be considered to have become effective thirty days after vaccination, calves may be admitted to the ordinary farm life from that time. They should be marked indelibly in some way,

or a very exact description should be taken, so that they may be recognized.

(*g*) Conclusions regarding the condition of vaccinated animals, and regarding the state of affairs in the herd after the practice of vaccination has been resorted to, as compared with that existing before, can be based only upon post-mortem examinations carried out by a specialist or by a veterinary inspector at the abattoir.

7. A positive reaction to tuberculin has been considered in bovine practice as evidence of the existence of tuberculosis. We now know that in animals vaccinated with B.C.G. it is evidence of a condition of allergy, that is to say, of resistance to infection. It is towards the generalization of this allergic condition produced in bovines by B.C.G., or some other method, that a negative reaction, indicating susceptibility, should lead us in the future.

Tuberculosis (Inoculation)[12]

The innocuity of the subcutaneous injection of B.C.G. against bovine tuberculosis is pointed out by the following facts: 3,819 bovines have been inoculated once, 1,579 twice, 714 three times, 199 four times, and 32 five times, and "in no case has there developed at the site of inoculation a reaction lesion giving rise to tubercular infection."

The mistaken view that the Calmette-Guérin vaccine is capable of causing tuberculosis is based upon the fact that at the place where the B.C.G. bacilli are introduced there develops after a time a regressive tubercle. The fact that the B.C.G. is an organism which is capable of producing a tubercle is put forward as evidence that it is capable of producing tuberculosis. My own experiments afford confirmation that inoculation experiments up to the 40th passage of a virulent bovine strain on media containing bile reveal a gradual attenuation, as is shown by progressive limitation of the tuberculous infection.

Discordance between the obvious protection against experimental infection and the less favorable results of experiments carried out in infected cow houses, should, in our opinion, be attributed to mixed infection of tuberculosis with the ray fungus (actinotuberculosis) for which there is ample opportunity in infected cowsheds.

The administration of a sufficiently large dose of B.C.G. *per os,* provided it is given in the first days after birth, will confer protection upon calves against natural infection.

The fixation abscess which results from the injection of tuberculosis vaccine acts as a protection against diseases associated with breeding. This sequel, which is recognizable by the farmer, is gratifying, and it has as its experimental basis "anachoresis," that is to say, the local lesion acts in such a way on the causal organisms of subsequent infections (vitulisepticus, *Bact. coli, Bact. paratyphosus,* strepto- and staphylococci) that their pathogenic action on susceptible organs is limited.

This "power of attraction," which comprises the first phase of anachoresis, is carried only on micro-organisms of that kind. Virulent tubercle bacilli which are introduced or which gain access are expelled again immediately by the vaccinated calves. The very slight distribution of tuberculosis in inoculated calves which we have found on post-mortem examination is to be referred to this specific repulsion.

Observation extending over several years, until a large number of post-mortem findings of old animals are available, will be required before the results of regular inoculation from birth onwards can be ascertained.

Triplets delivered by Dr. C. D. Hornbeck, Deep River, Iowa.

[12] Tuberkulose (Impfung); by Dr. Alberto Ascoli; Professor an der Tierärzlichen Hochschule and Direktor des Instituto Antitubercolare in Mailand, Milan, Italy. Presented at the Eleventh International Veterinary Congress, London, 1930.

Vaccination with Living Tubercle Bacilli[13]

The report gives the main features, experimental evidence, and results of investigations relating to B.C.G. undertaken by the Dominion Department of Agriculture, Health of Animals Branch, at the Animal Diseases Research Institute, Ottawa, Canada.

The questions chiefly concerned are those of virulence and immunizing efficacy; and in this connection three original strains of B.C.G. are under propagation and study. For comparative study, a strain of bovine tubercle bacilli, of ordinary or average virulence, is used in certain vaccination trials running parallel with those of B.C.G.

The experiments with cattle were started in January, 1925, and have continued to date. Vaccinal immunity or "premunization," was tested by (1) inoculation of measured doses of virulent bacilli and (2) natural exposure to tuberculous infection under farm conditions. In the trials by natural exposure, 1925-1927, the calves were vaccinated and treated in accordance with the Calmette-Guérin procedure as originally recommended; and in subsequent trials under the new conditions of isolation, etc., as advised in 1927.

The trials varied in duration from a few months up to 4½ years. Laboratory autopsies on 72 cattle revealed *evidence of tuberculous lesions* in 78.4% of cattle vaccinated with B.C.G., 90.0% of cattle vaccinated with virulent bovine tubercle bacilli, and 75.0% of the unvaccinated controls.

While slight percentage differences, in trials of varying duration and with a limited number of animals have little significance, it is fairly evident that there are no striking differences between the cattle vaccinated with B.C.G., those vaccinated with virulent bacilli, and the unvaccinated controls, in respect to autopsy evidence of tuberculous lesions. With regard to the relative extent of lesions, there is some evidence that in trials of short duration B.C.G. vaccination may retard the development of infection. This, however, seems more or less transient and in spite of revaccinations diminishes with time and as the cattle continue under exposure to natural reinfection.

Virulent bacillary infection of lesion-free lymphatic glands and of vaccinal nodes taken at the end of immunity trials is shown and attention drawn to the possible dangers arising therefrom.

B.C.G. possesses a latent virulence for guinea-pigs manifest, as a rule, in only a small percentage of test animals and after a very long period of incubation or tolerance.

The several independent investigations of B.C.G. vaccination of cattle reported from Canada and the United States are referred to and followed by a compilation of the *aggregate results* which indicates 61% (111 of 181) of cattle vaccinated with B.C.G., and 87% (125 or 143) of unvaccinated control cattle, with autopsy evidence of tuberculous lesions.

Legal Definitions Regarding the Practice of Veterinary Medicine[14]

Previous International Veterinary Congresses have paid a great deal of attention in their deliberations to the official definitions of State veterinary services and veterinary instruction and have promoted legislation regarding animal diseases and the inspection of meat.

It is thanks to the fruitful activities of veterinary surgeons in the matter of public health that our position is held in esteem, and in all countries with few exceptions is comparable with the other academic professions.

In each State a central office in the charge of a veterinary surgeon should be provided for the control of the veterinary service, and its Director should be immediately below the agricultural authority and responsible to it. This request has been put forward by the International Bureau of Epizootics and

[13] A Comparative Study of Vaccination with Living Tubercle Bacilli and with Special Reference to B. C. G.; by E. A. Watson; Chief Pathologist, Animal Diseases Research Institute, Department of Agriculture, Hull, Quebec, Canada. Presented at the Eleventh International Veterinary Congress, London, 1930.

[14] Gesetzliche Bestimmungen für die Ausübung der Tierheilkunde; by Prof. Dr. M. Burgi; Direktor des eidg. Veterinäramtes, Bern, Switzerland. Presented at the Eleventh International Veterinary Congress, London, 1930.

the Veterinary Committee of the League of Nations.

The official duties in connection with veterinary police and meat inspection should be undertaken by qualified veterinary surgeons.

The continued changes in the conditions of agriculture and the new results of scientific investigation and observation in practice make it necessary that education in veterinary medicine be so organized that veterinary surgeons are always fully competent to discharge both their public and private professional duties.

Since the establishment of the International Bureau of Epizootics in Paris and the setting up of the Veterinary Committee of the League of Nations questions regarding state veterinary service, international trade in animals and animal products, etc., have been dealt with by these bodies so that in future the discussions at our congresses can be greatly simplified. The publications of the International Bureau explain the state of affairs from time to time, questions, which it appears to be desirable to solve, can be submitted for investigation to those Institutions by our Permanent Commission or other veterinary organizations.

An academic certificate is desirable for admission to a course of veterinary instruction. Whether that instruction is given at a Veterinary High School or in the faculty of a University is of secondary importance.

As new subjects are introduced and as the number of hours required for other subjects must be increased, it is a matter for a special commission to ascertain whether it would not be possible to economize in the number of hours given to the preparatory subjects. A lengthening of the course of study should be considered, with due regard to the cost entailed, when this question is cleared up.

Extension of the instruction in the following subjects is desirable: genetics, meat and milk hygiene, contagious diseases, and the diseases of birds and bees.

It is recommended that a compulsory practical course be taken before the Diploma is conferred.

As students of veterinary medicine are recruited more and more from non-agricultural circles, preliminary instruction in agricultural subjects should be taken.

Governments are invited to put a stop to quackery by legal means and to make the practice of veterinary medicine dependent upon the possession of a diploma granted by one of the State colleges.

Only drugs the compounding of which and the effects of which have been tested by a central control body should be used. The use of secret remedies should be forbidden.

Sera and vaccines used in veterinary medicine should be tested officially and should be supplied to veterinary surgeons only.

The right to supply drugs and so called "ready packed" medicines by chemists, druggists, and by veterinary dispensers, should be regulated by law.

These propositions, which are in the interests of veterinary science, are recommended to the congress for acceptance.

The Practice of Veterinary Medicine and Surgery[15]

The practice of veterinary medicine is practically free in nearly all the countries of the world.

The legislative control which is required is the natural and essential complement of the establishment of centers of veterinary teaching. It is a matter which affects agricultural economics, sanitary police, and public hygiene.

The persistence of empiricism is incompatible with modern methods for the control of epizootic diseases. A country which tolerates empiricism cannot exercise proper control over its position as regards public health.

The legislation required should forbid absolutely all unqualified intervention in the treatment of animals, whether gratuitous or otherwise. Under certain conditions, existing empirics might be tolerated until they have died out.

[15] La Législation sur l'exercice de la médecine vétérinaire; by Professeur Dr. E. Leclainche; Chef des Services Vétérinaires, Ministère de l'Agriculture, Paris, France. Presented at the Eleventh International Veterinary Congress, London, 1930.

The Law Governing the Practice of Veterinary Medicine and Surgery[16]

The practice of veterinary medicine, or rather of veterinary science, possesses at the present day four well defined fields of action, which for their proper development and to ensure practical results, require legislative control.

1. In the past veterinary medicine was the art of curing the domesticated animals, and especially the horse. Today this still forms a very important part of professional life.

The practice of veterinary medicine and farriery have been protected by a number of legislative enactments in Spain since the Sixteenth Century. In Spain at the present time only those who have graduated from veterinary colleges are allowed to practice veterinary medicine and to be in charge of farriery establishments both for equines and bovines. The Spanish penal code inflicts imprisonment for four months to two years and a fine of 1,000 to 15,000 pesetas on all "quacks" who practice as veterinary surgeons without possessing qualification. The Ministry of the Interior protects the practice of farriery under the direction and control of a qualified veterinary surgeon. Spanish Law protects the practice of veterinary medicine in its widest sense—that is to say, the care of domesticated animals and farriery.

2. In modern times veterinary science plays a part in general sanitation for the protection of the Public Health. Meat inspection services were organized throughout Spain in 1859. By a Royal Decree of December 22nd, 1928, veterinary inspectors were put in charge of the control of all food products of animal origin (meat, fish, poultry, game, milk) and of vegetable origin (fruit and vegetables). The control is carried out at abattoirs, markets, canning factories, cowsheds, restaurants, etc. Lay inspectors are not recognized in Spanish law, all sanitary control of foodstuffs is under veterinary officials. We also have control of slaughter-houses and sausage factories, etc.

3. As a result of recent discoveries regarding epizootic diseases, which cause immense losses, veterinary science had formed a service the duty of which is to protect the health of animals by the application of prophylactic measures and immuno-therapy. The hygiene service is in the hands of veterinary surgeons in Spain and their duties comprise hygienic supervision and the trade in animals. Owners or their servants are allowed to carry out vaccination.

4. Finally, industrial exploitation of animals leads to improvement in animal production and at the same time increases the economic return with minimum outlay.

In order to obtain these results it is necessary to possess an array of biological and chemical knowledge regarding the functions of living organisms.

The great problems with which zootechny is concerned are: the science of breeding, the fixation and transmission of characters which aim at the production of pure types, in some cases from a biological point of view, and in others from the economic point of view, and feeding for the purpose of developing the animal and its products to the fullest extent (meat, milk, economic work).

Instruction in veterinary science provides those who obtain the diploma with a technical ability to succeed in the study of these problems, which are of such importance to agricultural economy. Consequently the veterinary surgeon should, in order that progress may be scientific, take a direct part in the activities of the laboratories and in all zootechnical experimental work.

[16] La Législation sur l'Exercice de la Médecine vétérinaire; by C. Sanz Egana, Directeur de l'Abattoir de Madrid, Spain. Presented at the Eleventh International Veterinary Congress, London, 1930.